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	Author's	Abhijit Paul, Abhijit Paul ,Agamani Mondal Research Scholar, Department of Education, Sidho-Kanho-Birsha University, Purulia, West Bengal Birbal Saha Professor, Department of Education, Sidho-Kanho-Birsha University, Purulia, West Bengal			
9	Paper ID	IJIFR/V4 /E5/ 010	Subject	Commerce	6200-6203
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	Author's	Sumit Labhsjetwar Postgraduate Studuent, Department of Pharmaceutics, SVKMs NMIMS School of Pharmacy And Technology Management, Shirpur, Dhule, Maharashtra Dr. Chandrakant Bonde Associate Professor, Department of Pharmaceutical Chemistry, SVKMs NMIMS School of Pharmacy And Technology Management, Shirpur, Dhule, Maharashtra Dr. Smita Bonde Assistant professor, Department of Quality Assuarncce, SVKMs NMIMS School of Pharmacy And Technology Management, Shirpur, Dhule, Maharashtra			
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	Author's	B. Saminathan Assistant Professor, Department of Education, CDE, Bharathidasan University, Trichy -Tamil Nadu (India)			

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12	Paper ID	IJIFR/V4 /E5/ 025	Subject	Education	6231-6237
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	Author's	<i>Dr. K. R. Rajenran</i> <i>Graduate Assistant, GHS School, Malaipatti, Tamil Nadu</i> <i>A.Selvaraj</i> <i>Ph.D scholar, Dravidian University, Kuppam (A. P.)</i> <i>Dr. S. Rajaguru</i> <i>Associate Professor, Department of Education, SRKV college of Education, Coimbatore</i> <i>G. Kalaiselvi</i> <i>Assistant Professor, Ramana college of Education, Aruppukottai, Tamil Nadu, India.</i>			
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15	Paper ID	IJIFR/V4 /E5/ 029	Subject	Education	6254-6258
	Title	<i>Affecting Factors on Students' Academic Achievement at the Secondary Level in Rural Schools</i>			
	Author's	<i>Dr. K. R. Rajenran , B. Chandrasekaran</i> <i>Graduate Assistant, GHS School, Malaipatti, Tamil Nadu</i> <i>A.Selvaraj</i> <i>Ph.D scholar,</i> <i>Dravidian University, Kuppam (A. P.)</i> <i>Dr. S. Rajaguru</i> <i>Associate Professor, Department of Education,</i> <i>SRKV college of Education, Coimbatore</i>			

Improvement of Power Quality by Unified Power Quality Conditioner : A Review

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1 st	Babasaheb B. Repe	M.E. Student Department of Electronics & Communication Engg. Dr. J. J. Magdum College of Engineering, Jaysingpur, Maharashtra
2 nd	Prof. A. P. Patil	Associated Professor Department of Electronics & Communication Engg. Dr. J. J. Magdum College of Engineering, Jaysingpur, Maharashtra

Abstract

This paper represents the power quality improvement with a comprehensive review on the unified power quality Conditioner (UPQC). In this is paper a broad overview on the different possible intelligent controls is given which is used with UPQC. In this paper a new control method to compensate the power quality problems is present with a three-phase unified power quality conditioner (UPQC) under balanced and unbalanced load conditions. The performance of proposed control system was studied with Matlab Simulink program. The proposed UPQC system can improve the power quality at the point of common coupling (PCC) on power distribution system under balanced and unbalanced load conditions.

I. INTRODUCTION

For improving power quality of electrical distribution system, Unified power quality control was widely studied by many researchers as an eventual method [1-3]. The function of unified power quality conditioner is to compensate supply voltage flicker and unbalanced, reactive power, negative-sequence current, and harmonics. In other words, on power distribution systems or industrial power systems, the UPQC has the capability of improving power quality at the point of installation. Therefore, the UPQC is expected to be one of the powerful solutions to improve the power quality under unbalanced condition[4]. The UPQC consisting of the combination of a series active power filter (APF) and shunt APF can also

compensate the voltage interruption if it has some energy storage or battery in the dc link [5]. Non-linear devices, such as power electronics converters, increase overall reactive power demanded by the equivalent load, and inject harmonic currents into the distribution grid. It is well known that the reactive power demand causes a drop in the feeder voltage and increases the losses. The presence of harmonic currents can cause additional losses and voltage waveform distortions, and so cause poor power quality [6]. Also, the number of sensitive loads that require ideal sinusoidal supply voltages for their proper operation has increased. The increasing use of electronic equipment sensitive to power variations drives the interest in power conditioning technologies. So, in order to keep the power quality within limits proposed by standards, it is necessary to include some sort of compensation [7-8]. The power electronic based power conditioning devices can be effectively utilized to improve the quality of power supplied to customers [3]. One modern solution that deals with both load current and supply voltage imperfections is the Unified Power Quality Conditioner (UPQC) [9], which was first presented in 1995 by Hirofumi Akagi. Such a solution can compensate for different power quality phenomena, such as: sags, swells, voltage imbalance, flicker, harmonics and reactive currents. UPQC is a combination of series and shunt active filters connected in cascade via a common dc link capacitor. The series active filter inserts a voltage, which is added at the point of the common coupling (PCC) such that the load side voltage remains unaffected by any voltage disturbance. The main objectives of the shunt active filter are: to compensate for the load reactive power demand and unbalance, to eliminate the harmonics from the supply current, and to regulate the common dc link voltage. The paper is organized as follows. The structure of the UPQC is presented in Section 2. Then, in Section III, the control principles are described in detail. The simulation model is presented in Section IV. Simulation results in this section demonstrate the efficacy and versatility of the proposed design technique. Finally, Section V gives the conclusion.

II. UPQC CONTROL ALGORITHM

The UPQC consists of two voltage source inverters connected back to back with each other sharing a common dc link. One inverter is controlled as a variable voltage source in the series APF, and the other as a variable current source in the shunt APF. Fig. 1 shows a basic system configuration of a general UPQC consisting of the combination of a series APF and shunt APF. The main aim of the series APF is harmonic isolation between load and supply; it has the capability of voltage flicker/ imbalance compensation as well as voltage regulation and harmonic compensation at the utility-consumer PCC. The shunt APF is used to absorb current harmonics, compensate for reactive power and negative-sequence current, and regulate the DC link voltage between both APFs. The operating principle of the UPQC is twofold. The purpose of the SAPF is to improve the quality of the load voltage by injecting the compensation voltage u_2 , whose amplitude is equal and phase opposite to the failures of the supply voltage u_s . On the other hand, the purpose of the PAPF is to improve the quality of the supply current by injecting the compensation current i_b , whose amplitude is equal and

phase opposite to the failures of the load current ilo. Both SAPF and PAPF have their own control systems. The control systems are based on the space vector calculation in the rotating reference frame, where the angular speed of the reference frame corresponds to the fundamental frequency, i.e in the synchronous reference frame.

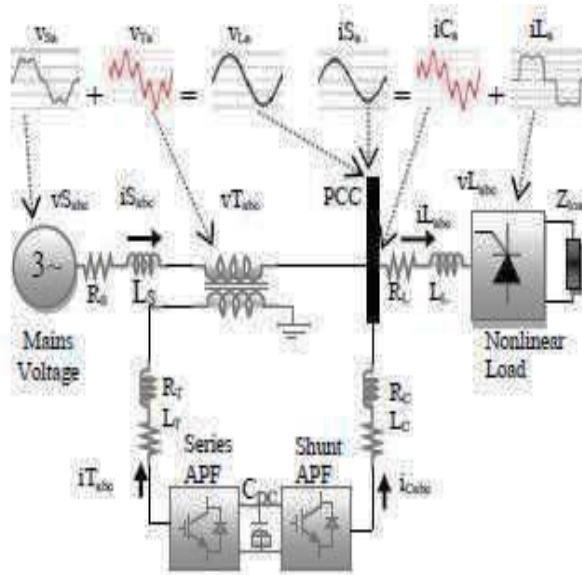


Figure 1: Unified power quality conditioner configuration.

The UPQC is a custom power device that integrates the series and shunt active filters, connected back-to-back on the dc side and sharing a common DC capacitor, as shown in Fig.2. It employs two voltage source inverters (VSIs) that are connected to a common DC energy storage capacitor. One of these two VSIs is connected in series with the feeder and the other is connected in parallel to the same feeder.

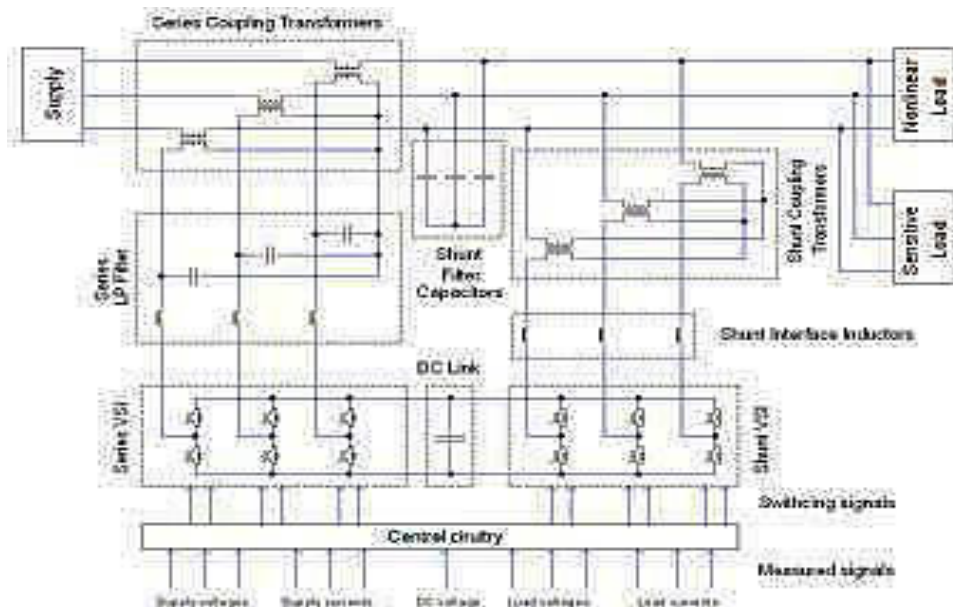


Figure 2: Power circuit diagram of a three-phase UPQC

The shunt active filter is responsible for power factor correction and compensation of load current harmonics and unbalances. Also, it maintains constant average voltage across the DC storage capacitor. The shunt part of the UPQC consists of a VSI (voltage source inverter) connected to the common DC storage capacitor on the dc side and on the ac side it is connected in parallel with the load through the shunt interface inductor and shunt coupling transformer.

The shunt interface inductors, together with the shunt filter capacitor are used to filter out the switching frequency harmonics produced by the shunt VSI. The shunt coupling transformer is used for matching the network and VSI voltages.

The series active filter compensation goals are achieved by injecting voltages in series with the supply voltages such that the load voltages are balanced and undistorted, and their magnitudes are maintained at the desired level. This voltage injection is provided by the dc storage capacitor and the series VSI. Based on measured supply and/or load voltages the control scheme generates the appropriate switching signals for the series VSI switches. The output voltages of the series VSI do not have the shape of the desired signals, but contain switching harmonics, which are filtered out by the series low pass filter. The amplitude, phase shift, frequency and harmonic content of injected voltages are controllable. The proposed UPQC control algorithm block diagram in Matlab/Simulink simulation software is shown in Fig.3.

A. Reference Voltage Signal Generation for Series APF

The function of the series APF is to compensate the voltage disturbance in the source side, which is due to the fault in the distribution line at the PCC. The series APF control algorithm calculates the reference value to be injected by the series APF transformers, comparing the positive-sequence component with the load side line voltages. supply voltages are transformed to d-q-0 coordinates.

$$\begin{matrix} V_{s0} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & V_{sa} \\ V_{sd} & \sin(\omega t) & \sin(\omega t - 2\pi/3) & \sin(\omega t + 2\pi/3) & V_{sb} \\ V_{sq} & \cos(\omega t) & \cos(\omega t - 2\pi/3) & \cos(\omega t + 2\pi/3) & V_{sc} \end{matrix}$$

B. Reference Current Signal Generation for Shunt APF

The shunt APF described in this paper used to compensate the current harmonics and reactive power generated by the nonlinear load. The shunt APF reference current signal generated. The instantaneous reactive power (p-q) theory is used to control of shunt APF in real time. In this theory, the instantaneous three-phase currents and voltages are transformed to α - β -0 coordinates.

$$\begin{matrix} V_0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & V_{sa} \\ V_\alpha & 1 & \frac{-1}{2} & \frac{\sqrt{3}}{2} & V_{sb} \\ V_\beta & 0 & \frac{\sqrt{3}}{2} & \frac{-1}{2} & V_{sc} \end{matrix}$$

In UPQC-P case the series compensator does not compensate for any part of the reactive power demand of the load, and it has to be entirely compensated by the shunt compensator.

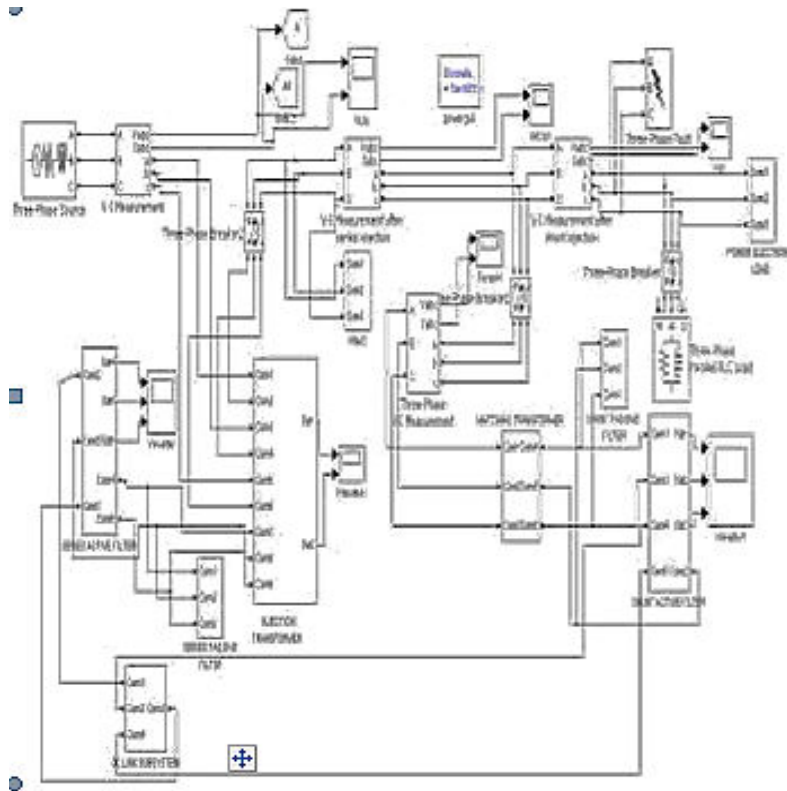


Figure 3: UPQC Simulation

Also the shunt compensator must provide the active power injected by the series compensator. Thus, in this case the VA rating of the shunt compensator increases, but that of the series compensator decreases.

In the case when the UPQC-P control strategy is applied, the injected voltage is in phase with the supply voltage; hence the load voltage is in phase with the supply voltage and there is no need for calculating the angle of the reference load voltage. Thus, the reference load voltage is determined by multiplying the reference magnitude (which is constant) with the sinusoidal template phase-locked to the supply voltage. Then, the reference series filter voltage is obtained.

Comparing the techniques for calculating the reference voltage of the series compensator, presented above, it can be concluded that the UPQC-P algorithm has the simplest implementation (it involves very little computation). In the UPQC-P case the voltage rating of the series compensator is considerably reduced. Also, the UPQC-Q compensation technique does not work in the case when the load is purely resistive. Therefore, the UPQC-P control strategy has been used in the UPQC simulation model. PI controller has been used for dc link voltage control in the UPQC simulation model.

III. SIMULATIONS AND RESULTS

A UPQC simulation model (Fig.4) has been created in MATLAB/Simulink so as to investigate UPQC circuit waveforms, the dynamic and steady-state performance, and voltage and current ratings. The following typical case studies have been simulated and the results are presented.

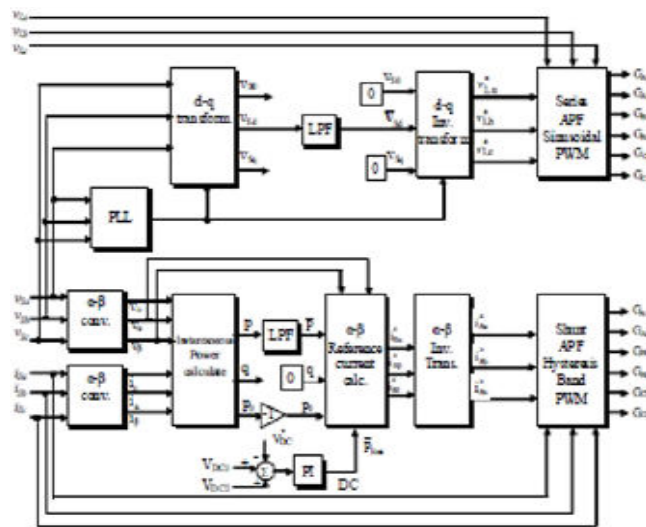


Figure 4: Series APF reference voltage and shunt APF reference current signal generation block diagram

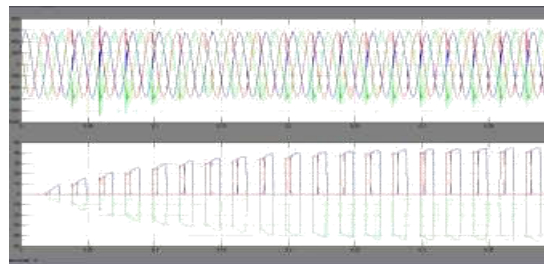
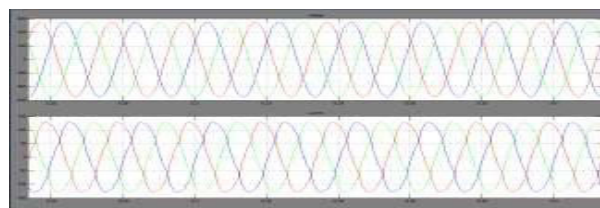


Figure 5: Steady state source voltage and load current waveforms (without UPQC) THD of source voltage: 25.9% , THD of load current:63%

1. Short duration three phase fault conditions.
2. Long duration three phase fault conditions.
3. Dynamic load and three phase fault conditions.
4. Harmonic compensation
5. DC link voltage regulation for the above conditions is also verified.

DC link voltage dips slightly during fault condition but is Maintained constant by UPQC. Simulation results show that UPQC mitigates deeper sags, harmonic compensation is better, does better load regulation and balancing for dynamic loads and can tolerate long duration fault conditions effectively. Thus it gives enhanced performance when compared to DSTATCOM and DVR. Results show that it gives good steady state and transient performance. The proposed control scheme is feasible and simple to implement although further work is needed to optimize the parameters of the UPQC.



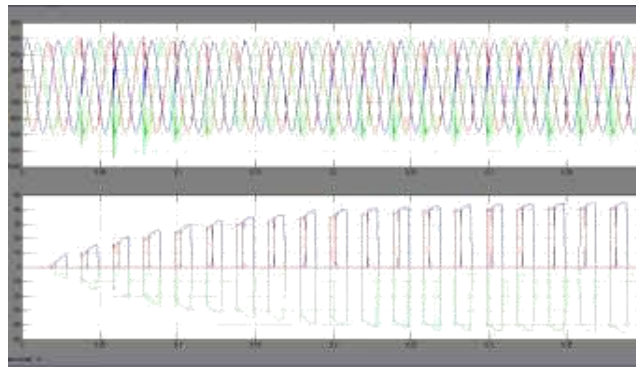


Figure 6 : Steady state source voltage and load current waveforms (with UPQC) THD of source voltage:0.98% ;THD of load current:1.03%

Fig.5 shows the simulation results for the case where the system is in steady state. Due to power electronic load the current waveform is distorted and is unbalanced. Voltage waveform is also distorted. Figure 6 shows the results after UPQC is connected to the system. The waveforms are balanced and THD is greatly reduced .This confirms that UPQC compensates harmonics to a great extent.

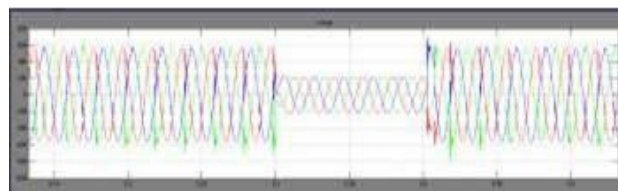


Figure 7: Source voltage when a three phase fault is introduced from 0.3 to 0.4 seconds. (without UPQC) (THD:27%)

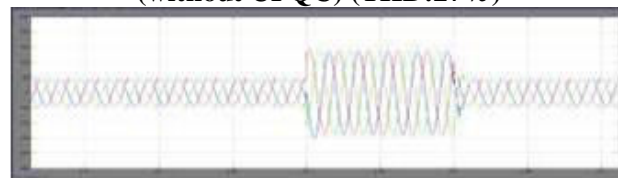


Figure 8:Compensating voltage injected by series active filter

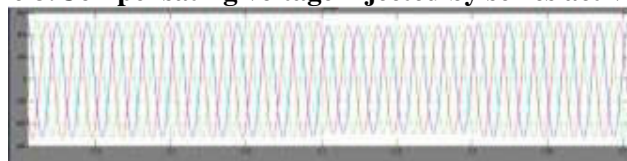


Figure 9: Source voltage when a three phase fault is introduced from 0.3 to 0.4 seconds. (with UPQC) (THD: 0.50%)

Figure 8-10 shows the simulation results when a three phase fault is introduced, the series active filter(DVR) injects the compensating voltage so that the source voltage is maintained constant. This shows that voltage imperfections are compensated by the series part of UPQC.



Figure10: Compensating current injected by shunt active filter

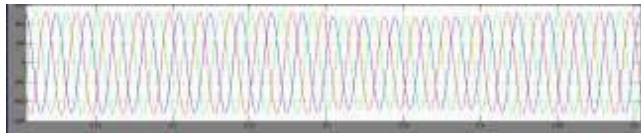


Figure 11: Load current when a three phase fault is introduced from 0.3 to 0.4 seconds. (with UPQC)



Figure 12: Source voltage when a three phase fault is introduced from 0.3 to 0.7 seconds. (without UPQC)



Figure 13: Compensating current injected by shunt active filter.

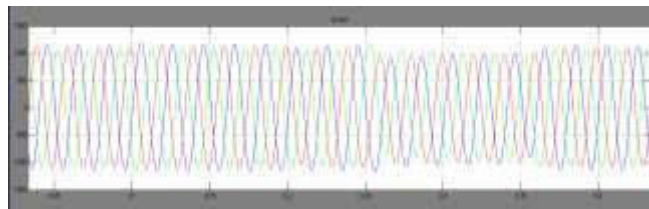


Figure 14: Load current when a three phase fault is introduced from 0.1 to 0.2 seconds and an RLC load from 0.25 to 0.35 seconds. (with UPQC)

IV. CONCLUSIONS

This paper describes a new control strategy used in the UPQC system, which mainly compensate reactive power and voltage and current harmonics in the load under non-ideal mains voltage and unbalanced load current conditions. The proposed control strategy use only loads and mains voltage measurements for series APF based on the synchronous reference frame theory. The instantaneous reactive power theory is used for shunt APF control algorithm by measuring mains voltage and currents. The conventional methods require measurements of the load, source and filter voltages and currents.

The simulation results show that, when unbalanced and nonlinear load current or unbalanced and distorted mains voltage conditions, the above control algorithms eliminate the impact of distortion and unbalance of load current on the power line, making the power factor unity. Meanwhile, the series APF isolates the loads voltages and source voltage, the shunt APF provides three-phase balanced and rated currents for the loads. The experimental results obtained from a laboratory model of 10 kVA, along with a theoretical analysis, are shown to verify the viability and effectiveness of the proposed UPQC control method.

Table 1: UPQC System parameters

	Parameters		Value
	Voltage	V_{sabc}	380 V _{rms}
Source	Frequency	f	50 Hz
Load	3-Phase ac Line Inductance	L_{Labc}	2 mH
	1-Phase ac Line Inductance	L_{La1}	1 mH Ω
	3-Phase dc Inductance	L_{dc3}	10 mH
	3-Phase dc Resistor	R_{dc3}	30 Ω
	1-Phase dc Resistor	R_{dc1}	87.5 Ω
	1-Phase dc Capacitor	C_{dc1}	240 μ F
dc-link	Voltage	V_{dc}	700 V
	Capacitor 1/2	$C_1 C_2$	2200 μ F
Shunt APF	ac Line Inductance	L_{Cabx}	3.5 mH
	Filter Resistor	R_{Cabx}	5 Ω
	Filter Capacitor	C_{Cabx}	10 μ F
	Switching Frequency	f_{swm}	~15 kHz
Series APF	ac Line Inductance	L_{Tabx}	1.5 mH
	Filter Resistor	R_{Tabx}	5 Ω
	Filter Capacitor	C_{Tabx}	20 μ F
	Switching Frequency	f_{swm}	12 kHz

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Social Cognition and Professional Competencies among B.T Assistant Teachers

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Key Words	Social Cognition, Professional Competencies, B.T. Assistant Teachers, Government Aided , Self-Financing Schools				

1st	C. Ashok Kumar	Research Scholar Department of Education Bharathidasan University, Tiruchirappalli
2nd	Dr. K.K. Rajendran	Assistant Professor Department of education Bharathidasan University, Tiruchirappalli

Abstract

Social cognition has its roots in social psychology which attempts "to understand and explain how the thoughts, feelings, and behavior of individuals are influenced by the actual, imagined, or implied presence of others" (Allport, 1985). It also studies about an individual within social or cultural context and focuses on how people perceive and interpret information they generate themselves (intrapersonal) and from others (interpersonal). In nutshell, social cognition influences the functioning of a teacher and his social interactions and his professional competencies help him to discharge his professional duties and responsibilities effectively and efficiently and also reshape his personality, habits and attitudes. The investigator being a teacher educator has prepared his mind to study about social cognition and professional competencies of B.T Assistant teachers. The main objective of this study is to find out the relationship between social cognition and professional competencies of B.T Assistant teachers. Social Cognition Scale developed by Jordan Carpenter (2009) and Professional Competencies Scale developed by Savan (1994) are used to collect relevant data. The sample consists of 98 B.T. Assistant teachers of whom 30 are men and 68 are women. The data are analysed by 't' test, 'F' test and Karl Pearson's Product Moment Correlation analysis. The result indicates that there is significant positive relationship between social cognition and professional competencies of B.T. Assistant teachers.

I. INTRODUCTION

Cognition is an organization of processes by which a living creature obtains knowledge of some objects or becomes aware of its environment. Cognitive processes are perception, discovery, recognition, imagination, judging, memorizing, learning, reasoning, analyzing, discriminating and thinking. Cognition refers to a human activity which is perceptual and communicable. Cognition therefore contracts with the pure objectivity of the state of consciousness, feeling and belief because it merely aims at revealing the truth. Social cognition has its roots in social psychology which attempts "to understand and explain how the thoughts, feelings, and behavior of individuals are influenced by the actual, imagined, or implied presence of others" (Allport, 1985). It also studies about an individual within social or cultural context and focuses on how people perceive and interpret information they generate themselves (intrapersonal) and from others (interpersonal). The term professional competence can be conceptualized as the procedure of gaining capacities and aptitudes which empowers to release professional duties and responsibilities all the more proficiently and successfully. In this context, professional competency can be considered as a highly valued quality which accounts for the efficient use of knowledge, skills, intellect, strength and capacity that are required to carry out one's functions and duties for the profession. Today, teacher competencies refer to the functional abilities that the teachers show in their teaching activity. It can be considered as an overall assessment of teachers' performance in classroom situations based on subject knowledge, strategies and techniques of teaching, teachers' personality, classroom management and clarity of objectives.

II. NEED AND SIGNIFICANCE OF THE STUDY

According to (Neisser, 1967), the term cognition refers to all the processes by which sensory input is "transformed, reduced, elaborated, stored, recovered and used". In fact man is a psycho-social production; basically as a social being, he interacts with his society because all his needs have been complied by socialization. So, social cognition occupies the major part of human cognition. Social cognition is social perception, conception and relationship in the social development of the human beings. It is also understood that every effective experience whether it be a simple sensation, a general feeling or a complex emotion presupposes some forms of social cognitive structures. The term 'professional competency' is made of two words 'professional' and 'competency', to have a better understanding of the term, the meaning and definition of the two words will be helpful. A profession may be defined as an occupation based upon intellectual study and training, the purpose of which is to supply skilled service to others for a definite 'fee or salary. When one uses the term 'professional' to any job or occupation, it is supposed to have certain distinguishable features that normally go with a profession, such as process of responding to certain specific needs of a society, knowledge that is unique to that 'profession', unique professional attitude seen among its members, a service orientation, professional-client relationship, by a code of ethics followed by its members, one who belongs to the profession

takes the job as a principal or major activity and is known to the whole community as such with that identity and constant development.

In this regard there is a need of systematic study on social cognition and professional competencies among teachers for analyzing the context and the relationship of social cognition and professional competency exhibited by the teachers. The role of a teacher is to concentrate on the facilitation of learning and development of all students since the teachers should have deep understanding of the students, the nature of learning, the subject they teach and the world around them. Teachers shouldn't bore, mislead or confuse the students but, they should be brought to interact with important knowledge. The emergence of globalised world in the frame work of competitions together with the pressure of an exploding knowledge base has given rise to new challenging roles for the teachers and this emergence inspires the investigator to pursue the present study with special reference to the relationship of social cognition and professional competence of the B.T. Assistant teachers and to reveal the existing status of social cognition and professional competencies in them.

III. STATEMENT OF THE PROBLEM

The problem selected for the present study is the relationship between social cognition and professional competencies among B.T. Assistant Teachers. The present study is designed to explore the existing status of social cognition and professional competencies of B.T. Assistant teachers and to find out whether there is any significant relationship between social cognition and professional competencies of those teachers. The study is helpful in establishing the importance of social cognition and professional competencies among B.T. Assistant teachers.

IV. TITLE OF THE STUDY

“Social Cognition and Professional Competencies among B.T. Assistant Teachers”

V. OPERATIONAL DEFINITIONS

5.1 Social Cognition

“Social Cognition” represents an individual within social or cultural context and focuses on how people perceive and interpret information they generate by themselves (intrapersonal) and from others (interpersonal).

5.2 Professional Competencies

“Professional competency” can be considered as a highly valued quality which accounts for the efficient use of knowledge, skills, intellect, strength and capacity that are required to carry out one's functions and duties for the profession.

VI. OBJECTIVES OF THE PRESENT STUDY

The following are the objectives of the present study:

1. To find out whether there is any significant difference among B.T. Assistant teachers in their social cognition with regard to the background variables namely: (i) Gender (Men

- and Women), (ii) Marital Status (Married and Unmarried), (iii) Qualification (Under Graduation with B.Ed., and Post Graduation with B.Ed.), (iv) Subject handled by the Teacher (Arts and Science), (v) Nature of School (Government, Govt. Aided and Self-financing) and (vi) Locality of School (Rural and Urban).
2. To find out whether there is any significant difference among B.T. Assistant teachers in their professional competencies with regard to the background variables namely: (i) Gender (Men and Women), (ii) Marital Status (Married and Unmarried), (iii) Qualification (Under Graduation with B.Ed., and Post Graduation with B.Ed.), (iv) Subject handled by the Teacher (Arts and Science), (v) Nature of School (Government, Govt. Aided and Self-financing) and (vi) Locality of School (Rural and Urban).
 3. To find out whether there is any significant relationship between social cognition and professional competencies of B.T. Assistant teachers.

VII. NULL HYPOTHESES

The following are the hypotheses formulated for the present study

1. There is no significant difference among B.T. Assistant teachers in their social cognition with regard to the background variables namely: (i) Gender (Men and Women), (ii) Marital Status (Married and Unmarried), (iii) Qualification (Under Graduation with B.Ed., and Post Graduation with B.Ed.), (iv) Subject handled by the Teacher (Arts and Science), (v) Nature of School (Government, Govt. Aided and Self-financing) and (vi) Locality of School (Rural and Urban).
2. There is no significant difference among B.T. Assistant teachers in their professional competencies with regard to the background variables namely: (i) Gender (Men and Women), (ii) Marital Status (Married and Unmarried), (iii) Qualification (Under Graduation with B.Ed., and Post Graduation with B.Ed.), (iv) Subject handled by the Teacher (Arts and Science), (v) Nature of School (Government, Govt. Aided and Self-financing) and (vi) Locality of School (Rural and Urban).
3. There is no significant relationship between social cognition and professional competencies of B.T. Assistant teachers.

VIII. METHOD USED FOR THE STUDY

For the present study, survey method is employed. By administering the questionnaires, necessary data will be collected.

IX. SAMPLE OF THE PRESENT STUDY

The B.T. Assistant teachers working in high and higher secondary schools will be the population of the present study. From this population, 98 B.T. Assistant teachers will be selected by means of stratified random sampling technique. The sampling will be stratified on the basis of gender, marital status, qualification, subject handled by the teachers, nature of the school and locality of the school.

X. TOOLS USED IN THE PRESENT STUDY

1. Social Cognition Scale developed by Jordan Carpenter (2009).
2. Professional Competencies Scale developed by Savan (1994).

XI. STATISTICS USED IN THE PRESENT STUDY

For analyzing the data, the investigator will use mean, standard deviation, 't'- test, ANOVA and Karl Pearson's Product Moment Correlation analysis.

XII. ANALYSIS OF DATA

Null Hypothesis - 1

There is no significant difference between men and women B.T. Assistant teachers in their social cognition.

Table – 1: Mean score difference between men and women B.T. assistant teachers in their social cognition

Variable	Gender	Mean	SD	't' Value	Remarks at 5% level
Social Cognition	Men	150.83	15.36	0.795	NS
	Women	148.18	15.18		

(At 5% level of significance, the table value is 1.96)

The above table shows that there is no significant difference between men and women B.T. Assistant teachers in their social cognition as the calculated 't' value is 0.795 is less than the table value 1.96 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 2

There is no significant difference between married and unmarried B.T. Assistant teachers in their social cognition.

Table – 2: Mean Score Difference between Married and Unmarried B.T. Assistant Teachers in Their Social Cognition

Variable	Marital Status	Mean	SD	't' Value	Remarks at 5% level
Social Cognition	Married	149.07	14.31	0.088	NS
	Unmarried	148.75	18.05		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is no significant difference between married and unmarried B.T. Assistant teachers in their social cognition as the calculated 't' value 0.088 is less than the table value 1.96 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 3

There is no significant difference between B.T. Assistant teachers holding Under Graduation with B.Ed., and Post Graduation with B.Ed., in their social cognition.

Table – 3: Mean score difference between B.T. assistant teachers holding under graduation with b.ed., and post graduation with B.Ed., in their social cognition

Variable	Educational Qualification	Mean	SD	't' Value	Remarks at 5% level
Social Cognition	UG with B.Ed.,	144.42	14.88	2.05	S
	PG with B.Ed.,	151.70	15.00		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is significant difference between B.T. Assistant teachers holding Under Graduation with B.Ed., and Post Graduation with B.Ed., in their social cognition as the calculated 't' value 2.05 is greater than the table value 1.96 at 5% level of significance. Hence the null hypothesis is rejected.

Null Hypothesis - 4

There is no significant difference among B.T. Assistant teachers of government, government aided and self-financing schools in their social cognition.

Table – 4: Mean score difference among B.T. assistant teachers of government, government aided and self-financing schools in their social cognition

Source of variables	Sum of square	'df'	Mean score	Calculated 'F' value	Remarks at 5% level
Between	25.85	38	.680	1.113	NS
Within	36.06	59	.611		
Total	61.91	97			

(At 5% level of significance, the table value is 3.00)

From the above table it is understood that there is no significant difference among B.T. Assistant teachers of government, government aided and self-financing schools in their social cognition as the calculated 'F' value 1.113 is less than the table value 3.00 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 5

There is no significant difference between the B.T. Assistant teachers handling arts and science subjects in their social cognition.

Table – 5: Mean score difference between B.T. assistant teachers handling arts and science subjects in their social cognition

Variable	Subject	Mean	SD	't' Value	Remarks at 5% level
Social Cognition	Arts	149.75	14.23	0.603	NS
	Science	147.85	16.71		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is no significant difference between the B.T. Assistant teachers handling arts and science subjects in their social cognition as the calculated 't' value 0.603 is lower than the table value 1.96 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 6

There is no significant difference between B.T. Assistant teachers of rural and urban schools in their social cognition.

Table – 6: Mean score difference between B.T. assistant teachers of rural and urban schools in their social cognition

Variable	Locality	Mean	SD	't' Value	Remarks at 5% level
Social Cognition	Rural	149.63	13.93	3.544	S
	Urban	147.89	17.35		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is significant difference between B.T. Assistant teachers of rural and urban schools in their social cognition as the calculated 't' value 3.544 is greater than the table value 1.96 at 5% level of significance. Hence the null hypothesis is rejected.

Null Hypothesis - 7

There is no significant difference between men and women B.T. Assistant teachers in their professional competencies.

Table – 7: Mean Score Difference Between Men and Women B.T. Assistant Teachers in Their Professional Competencies

Variable	Gender	Mean	SD	't' Value	Remarks at 5% level
Professional Competencies	Men	201.73	5.97	1.968	S
	Women	198.79	7.43		

(At 5% level of significance, the table value is 1.96)

The above table shows that there is significant difference between men and women B.T. assistant teachers in their professional competencies as the calculated 't' value is 1.968

is greater than the table value 1.96 at 5% level of significance. Hence the null hypothesis is rejected.

Null Hypothesis - 8

There is no significant difference between married and unmarried B.T. Assistant teachers in their professional competencies.

Table – 8: Mean Score Difference Between Married And Unmarried B.T. Assistant Teachers In Their Professional Competencies

Variable	Marital Status	Mean	SD	't' Value	Remarks at 5% level
Professional Competencies	Married	199.82	6.55	0.317	NS
	Unmarried	199.29	8.79		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is no significant difference between B.T. Assistant teachers of married and unmarried in their professional competencies as the calculated 't' value 0.317 is less than the table value 1.96 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 9

There is no significant difference between the B.T. Assistant teachers of under graduation with B.Ed., and post graduation with B.Ed., in their professional competencies.

Table – 9: Mean score difference between the B.T. assistant teachers of under graduation with B.Ed., and post graduation with B.Ed., in their professional competencies

Variable	Educational Qualification	Mean	SD	't' Value	Remarks at 5% level
Professional Competencies	UG with B.Ed.,	198.94	8.44	2.715	S
	PG with B.Ed.,	200.04	6.46		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is significant difference between the B.T. Assistant teachers of under graduation with B.Ed., and post graduation with B.Ed., in their professional competencies as the calculated 't' value 2.715 is greater than the table value 1.96 at 5% level of significance. Hence the null hypothesis is rejected.

Null Hypothesis - 10

There is no significant difference among B.T. Assistant teachers of government, government aided and self-financing schools in their professional competencies.

Table – 10: Mean score difference among B.T. assistant teachers of government, government aided and self-financing schools in their professional competencies

Source of variables	Sum of square	'df'	Mean score	Calculated 'F' value	Remarks at 5% level
Between	17.13	26	.659	1.045	NS
Within	44.78	71	.631		
Total	61.91	97			

(At 5% level of significance, the table value is 3.00)

From the table it is understood that there is no significant difference among B.T. Assistant teachers of government, govt. aided and self financing schools in their professional competencies as the calculated 'F' value 1.045 is lower than the table value 3.00 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 11

There is no significant difference between the B.T. assistant teachers handling arts and science subjects in their professional competencies.

Table – 11: Mean score difference between B.T. assistant teachers handling arts and science subjects in their professional competencies

Variable	Subject	Mean	SD	't' Value	Remarks at 5% level
Professional Competencies	Arts	199.31	6.23	0.663	NS
	Science	200.28	8.34		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is no significant difference between B.T. assistant teachers handling arts and science subjects in their professional competencies as the calculated 't' value 0.663 is lower than the table value 1.96 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 12

There is no significant difference between B.T. Assistant teachers of rural and urban schools in their professional competencies.

Table – 12: Mean Score Difference between B.T. Assistant Teachers of Rural and Urban Schools in their Professional Competencies

Variable	Locality	Mean	SD	't' Value	Remarks at 5% level
Professional Competencies	Rural	200.44	6.88	1.359	NS
	Urban	198.42	7.43		

(At 5% level of significance, the table value is 1.96)

From the above table it is learnt that there is no significant difference between the B.T assistant teachers of rural and urban schools in their professional competencies as the calculated 't' value 1.359 is lower than the table value 1.96 at 5% level of significance. Hence the null hypothesis is accepted.

Null Hypothesis - 13

There is no significant relationship between social cognition and professional competencies of B.T Assistant teachers.

Table – 13: Relationship between social cognition and professional competencies of B.T assistant teachers

Variable	N	Mean	SD	'γ' Value	Remarks at 5% level
Social Cognition	98	148.64	14.62	3.16	S

Professional Competencies	98	199.42	6.99		
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(At 5% level of significance, the table value is 3.00)

From the above table it is learnt that there is significant relationship between social cognition and professional competencies of the B.T Assistant teachers as the calculated ' γ ' value 3.16 is greater than the table value 3.00 at 5% level of significance. Hence the null hypothesis is rejected.

XIII. MAJOR FINDINGS

- a. There is no significant difference between men and women B.T. Assistant teachers in their social cognition.
- b. There is no significant difference between married and unmarried B.T. Assistant teachers in their social cognition.
- c. There is significant difference between the B.T. Assistant teachers holding under graduation with B.Ed., and post graduation with B.Ed., in their social cognition. While comparing the mean scores, B.T. Assistant teachers holding post graduation with B.Ed., stand higher in their social cognition than their under graduation holding counterparts.
- d. There is no significant difference among B.T. Assistant teachers of government, govt. aided and self-financing schools their social cognition.
- e. There is no significant difference between B.T. Assistant teachers handling arts and science subjects in their social cognition.
- f. There is significant difference between B.T Assistant teachers of rural and urban schools in their social cognition. While comparing the mean scores, B.T. Assistant teachers of rural schools are higher in their social cognition than their urban school counterparts.
- g. There is significant difference between men and women B.T. Assistant teachers in their professional competencies. Men teachers are higher in their professional competencies than their women counterparts.
- h. There is no significant difference between married and unmarried B.T. Assistant teachers in their professional competencies.
- i. There is significant difference between B.T. Assistant teachers holding under graduation with B.Ed., and post graduation with B.Ed., in their professional competencies. While comparing the mean scores, B.T. Assistant teachers holding post graduation with B.Ed., stand higher in their professional competencies than their under graduation holding counterparts.
- j. There is no significant difference among B.T. Assistant teachers of government, govt. aided and self-financing schools in their professional competencies.
- k. There is no significant difference between B.T. Assistant teachers handling art and science subjects in their professional competencies.
- l. There is no significant difference between B.T Assistant teachers of rural and urban schools in their professional competencies.

- m. There is significant relationship between social cognition and professional competencies of B.T Assistant teachers.

XIV. INTERPRETATIONS AND DISCUSSION

The investigator with his limited observations and experience in the field of educational research has come out with the following interpretations to the findings of the present study.

The 't' test results regarding the variable '**Social Cognition**' reveal that there is no significant difference between men and women B.T. Assistant teachers in their social cognition. The finding is supported by the study conducted by **Anjali S. Panikkar** (2001) revealing that there was no significant gender based difference with regard to the social cognition of the teachers. Similarly, the present study reveals that there is no significant difference in their social cognition of the B.T. Assistant teachers with regard to their marital status (married and unmarried) and the subject handled by them (arts and science). Also there is no significant difference in their social cognition with regard to nature of school (Government, Govt. Aided and Self-financing). But the present investigation reveals that there is significant difference between B.T. Assistant teachers holding under graduation with B.Ed., and post graduation with B.Ed., in their social cognition. While comparing the mean scores, the teachers holding post graduation with B.Ed., are higher in their social cognition than their counter parts. This may be because of the higher level maturity and the related education based practices of the post graduation holding teachers. Likewise, there is significant difference between rural and urban school B.T. Assistant teachers in their social cognition and the rural school teachers are higher in their social cognition than the urban school teachers. This may be due to the curious and information seeking behaviour of the rural school teachers that make them stand higher in their level of social cognition than their urban school counter parts.

The 't' test results regarding the variable '**Professional Competencies**' reveal that there is significant difference in the professional competencies of B.T. Assistant teachers with regard to their gender (men and women). While comparing the mean scores, men teachers are higher in their professional competencies than their women counterparts. This shows that gender of the teachers; in one way or other has got an influence on the professional competencies of the teachers. This may be due to their outgoing nature and applied knowledge of spontaneity. This finding is supported by the findings of the study conducted by **Surajit Mahanta** (2012) revealing that there was significant difference between male and female teachers in their professional competencies. But, unlike the present study, female teachers were slightly more advanced in their professional competencies than their male counterparts. Similarly, the study conducted by **M. Nur Mustafa** (2013) also indicated that the female teachers were higher in their professional competencies than the male teachers. On the same line, the present study reveals that there is significant difference in the professional competencies of the B.T. Assistant teachers holding under graduation with B.Ed., and the teachers holding post graduation with B.Ed.,

The mean score difference proves that the teachers holding post graduation with B.Ed., stand higher in their professional competencies than their counterparts. And this may be because of the higher level qualification with the age and maturity of the post graduation holding teachers. This finding is supported by the findings of the study conducted by **Sheik Allauddin** (1999) indicating that educational qualification of secondary school teachers had a significant influence on the professional competencies of the teachers. Also the findings of the study conducted by **Uday Koundinya** (1999) showed that the teachers with high educational qualification and high designation were highly competent than their counterparts. But contrarily, the findings of the study conducted by **Kambhampati Prasad** (2007) revealed that there was no significant relationship between teaching competency and academic qualification of the teachers.

On the other side, the present study shows that there is no significant difference in the professional competencies of the B.T. Assistant teachers with regard to their marital status (married and unmarried) and the subject handled by them (arts and science). Also there is no significant difference in the professional competencies of the B.T. Assistant teachers with regard to the nature of the school (Government, Govt. Aided and Self-financing) and the locality of the school. These findings of the present study are supported by the findings of the study conducted by **Syedda Shanavaz** (2007) revealing that there was no significant difference in the professional competencies of high school teachers based on the nature and locality of the schools. Similarly the findings of the study conducted by **Sheik Allauddin** (1999) found that the type of management of schools did not have any influence on the professional competencies of the teachers. On the contrary, the findings of the study conducted by **Surajit Mahanta** (2012) revealed that there was significant difference between rural and urban school teachers in their professional competencies. Further it was found that urban school teachers were more superior in their professional competencies than their rural counterparts.

The 'γ' test results reveal that there is significant positive relationship between social cognition and professional competencies of B.T. Assistant teachers. The findings of the present investigation are supported by the study conducted by **Anjali S. Panikkar** (2001) proving that there was significant positive relationship between reaction pattern and social cognition and between creativity and social cognition. Also, the study revealed the existence of moderately strong positive relationship between problem solving ability and social cognition. Likewise, the findings of the study undertaken by **Kanakala Jayaram** (2010) indicated that there was significant positive relationship among creativity, professional pleasure and professional competency of the teachers.

XV. CONCLUSION

'Social Cognition' is social perception, conception and relationship in the social development of the human beings. In general, social cognition is the study of how people interpret, analyze, remember and use information about the social world, since every effective experience whether it be a simple sensation, a general feeling or a complex

emotion presupposes some forms of social cognitive structure. ‘**Professional Competence**’ means the acquisition of knowledge, skills and ability which help a teacher to discharge his professional duties and responsibilities effectively and efficiently and also reshaping the attitudes, habits and personality of teacher. With regard to a teacher’s behavioral perspectives, social cognition is a personality trait that indicates the extent to which a teacher enjoys and is willing to exert effort towards understanding the mental states of his learners. In other words, need for social cognition is an individual difference that affects how much people seek out theories and explanations about mind activities because, individuals high in social cognition could be more sophisticated and skillful when observing others or communicating with others. Similar to the understanding of the term social cognition, professional competency can be perceived as a complex variable, difficult to define precisely, teacher effectiveness, teaching success, successful teaching, teaching efficiency; teaching performance and teaching ability.

With reference to the present study and its findings, social cognition endows a teacher with the necessary skills for observing the students and communicating with them effectively.

Professional competence enables a teacher gaining capacities and aptitudes which empowers him to release professional duties and responsibilities all the more proficiently and successfully. In teaching profession, the competency or effectiveness of a teacher is a very complicated concept since it is multi-dimensional. It can be viewed from three dimensions and they are (i) the characteristics of teachers, (ii) the practices adopted by the teachers and (iii) the outcomes through their teaching. These three dimensions of the teacher effectiveness may be influenced by the orientation of the teachers towards their social cognition. So, there can be a strong relationship between professional competency and social cognition, while considering teacher behavior, teacher attitude and teacher effectiveness. In this rearview the findings of the present study also confirm fact that there is significant positive relationship between social cognition and professional competencies of the teachers. On the one side, social cognition influences the functioning of teachers and their social interactions and on the other side, it helps them to get attuned with their professional competencies. In nutshell, it is conducted that social cognition influences the functioning of a teacher and his social interactions and his professional competencies help him to discharge his professional duties and responsibilities effectively and efficiently and also reshape his personality, habits and attitudes.

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Techno Stress: A New Bane to the Students

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1 st	Komala H. M.	M. Ed. Student Department of Education Vijaya Teachers College, Jayanagar, Bengaluru
2 nd	Dr. P T Meena	Assistant Professor Department of education Vijaya Teachers College, Jayanagar, Bengaluru

Abstract

Technostress is an ailment of modern culture, which manifests itself in two ways: the anxiety that is experienced with new and unfamiliar technology or stress as a result of the over identification with technology. In the blind race of globalization, the internet users are increasing very rapidly and with the same speed the internet users are reporting increased level of techno-stress more particularly teenagers are most vulnerable to these negative effects. The daily uses of smartphones, tablets, and personal computers have created a compulsion to constantly connect to the Internet and social media. This compulsion can have an effect on one's stress level and overall health. Studying the impact of technostress among the students is an interesting exercise. The students agreed that computers were an important part of daily life and they agreed to learn about them to feel competent to use them. This article particularly highlights the cause and problems of technostress faced by students and some suggestions to overcome from this.

I. INTRODUCTION

The creation of computer software and hardware, telecommunications, databases, and the Internet has affected society as a whole, by giving people new productivity options and changing the way they work. In the 'information age' the increasing use of information technology has become the driving force in the way people work, learn, and play. Adapting to technology is not simple. Some people tend to embrace change while others resist change. Techno stress is nothing but negative attitudes towards computers and newly introduced technologies. Techno stress is described by many researchers in various terms like: technophobia, cyber phobia, computer phobia, computer anxiety, computer stress, negative

computer attitudes, and computer aversion. Thus the rapid introduction of technology may cause individuals in organizations to suffer from a combination of technology fatigue and aversion and this can lead to techno stress.

II. CONCEPT OF TECHNO STRESS

The term techno stress was coined in 1984 by a clinical psychologist Dr. Craig Brod. New technology is causing a revolution in education. Technology should make life simpler, now a days student's clearly take pride in being able to use the same computer-based tools employed by professionals and it is becoming like a disease and making our life complex. Everyone will make use of technology, even students also. But they do not know how much they addicted to technology. They were started using technology in negative manner knowingly or unknowingly. Because of this unnecessarily students are suffering a lot. It is effecting on students daily life, personal life and their health also because many of them they do not know how to use it as beneficially and its bad effect that how it will make them to depend on technology completely.

Now day's technology is using in teaching-learning process also to make learner to better understand about any concept. With the dispersion and adoption of new technologies, circumstances forcing people to use these technologies manifests stress based on technology – techno stress. A huge myth in higher education today is that students entering academia already know about computers because they learned it in high school or at their last institution. Students of any age or gender from the “have-nots” side of the digital divide will have less experience with computers, as they may not have them at home, or may have come from school districts with poor funding and few or outdated technological resources. These students may have more challenges to face, because they are expected, as young people, to be completely "wired" simply because of their age, and their economic cohort may be a source of embarrassment. Miner cites studies from the late 1990s indicating that about a third of college students were technophobic. That means all kind of students have techno stress feeling. Techno stressed people may be visibly uncomfortable, and appear confused, disoriented, or anxious. Feelings of embarrassment, anxiety, and fear create an impediment to the learning process—which in turn a negative effect on the person's ability to operate a computer, thus creating a self-fulfilling prophecy.

III. CAUSES OF TECHNO STRESS

1. Techno-overload (high pressure of to cope up with information overload)
2. Techno-complexity (the complexity of new ICTs that makes users to feel incompetent)
3. Techno-insecurity (feeling of insecurity to do comparatively better performance)
4. Techno-uncertainty (the constant changes, upgrades and bug fixes in ICT hardware and software impose stress on the users)
5. Techno-invasion (unnecessary interference of technology in personal life)
6. Lack of reliable and user friendly software and hardware
7. High pressure of meeting to the expectations of parents

8. Physiological changes due to their adolescent age
9. Development of negative self-concept
10. Setting up unrealistic goals
11. Worrying about upcoming exams
12. Selection of subjects/stream/course of study
13. One-sided love relationship
14. Maladjustment due to –
 - (a.) changing of schools;
 - (b.) monotonous environment of school
 - (c.) cumbersome homework
 - (d.) unnecessary extra co-curricular activities
 - (e.) high norms of school/institutions
 - (f.) rejection by his friends and peer group
15. Feeling of insecurity due to -
 - (a.) death/separation/divorce of his parents
 - (b.) financial problem
 - (c.) unwanted quarrel between parents
 - (d.) concern about a new part time job
 - (e.) chronic/severe illness

IV. PROBLEMS FACED BY STUDENTS

1. The students will experiences anxiety such as tension headaches, sweaty palms, heart palpitations and a queasy stomach when thinking about or using computer technology and anxiety about possible present or future interactions with computers or computer related technology and insecurity.
2. Self-deprecating statements and thought and lack of confidence.
3. Techno stress largely centre on frustration and feelings of being overwhelmed and out of control.
4. A lack of empathy for others and a low tolerance for the ambiguities of human behaviour and communication.
5. Mental pressure from overexposure or involvement with technology.
6. Dependency on technology makes them lazy.

V. SUGGESTED SOLUTIONS TO OVERCOME FROM TECHNO STRESS

1. Using appropriate and user friendly soft wares.
2. Improve knowledge and skills to cope with rapid changing technology
3. Focus only on the information that really needed. Think critically and separate the gems from the dross.
4. Keeping a sense of humour and sharing feelings with parents and to some good friends and don't making a communication gap with them.
5. Creating a network of good friends and stay in touch with the people who can provide

you emotional and other support in coping with stress/techno-stress.

6. Practicing a regular exercise more particularly to the neuromuscular relaxation exercises e.g. yoga, meditation, long breathing, mindfulness and goes for a morning walk etc.
7. Doing some creative and enjoyable work e.g. works in the garden, reading good and interesting books and self-expression etc.
8. Expressing feelings e.g. talk, laugh, cry, and anger instead of bottling them up.
9. Set realistic and attainable goals and making themselves safer with the alternatives to frustrated goals.

VI. CONCLUSION

Technologies are supposed to be time-saving devices that make life easier and more convenient. But it shows so many negative impacts on students. It depends on how the students are using technology for their academic improvement or their personal life comfortless. The impact of technology on one's life is crossing the barriers within no time. The attraction towards internet for exploring the different possibilities of experiences paving the way for various kinds of unacceptable tasks and activities. The responsibility of parents and teachers is much more important and essential for cross checking the utilization process by the students. The stress provided by the usage of this technological devices effect various spheres of a person. The technology is dominating our students. In academic or in personal life the effect of technology has an immense role and there is a crucial necessity to check the time spent by the students for the use of the technological support for their personal and academic life. Techno stress should be taken care of for a productive future society.

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- [9] Website: www.ijetae.com
- [10] sgaither@georgiasouthern.edu
- [11] <https://unplugstolaf.wordpress.com/technostress/>

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Impact of Resilience on Maladaptive Behaviours among Adolescents at Higher Secondary School Level

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Key Words	Resilience, Maladaptive Behaviours, Adolescents, Higher Secondary School				

Rony S.Robert

**UGC Senior Research Fellow
School Of Pedagogical Sciences
Mahatma Gandhi University Kottayam, Kerala**

Abstract

Resilience is the ability to get back to a previous state of normal self after undergoing a period of negativity and maladaptive behaviour is what creates a barrier in for the getting back to normal self of the individual. If one succumb to maladaptive behaviours it is likely that resilience tend to take more time. The study aimed at finding out the resilience and maladaptive behaviours among adolescents at higher secondary school level. The present study was carried out on a sample of 300 adolescents from Kollam District, Kerala, India. Normative survey method is used for the study. Questionnaire on resilience and maladaptive behaviours are the tools used to collect data. Computation of percentages, critical ratio and coefficient of correlation were performed as a part of statistical data analysis of the present study. The study revealed that there is a significant negative relationship between the variables selected.

I. INTRODUCTION

Resilience helps an individual to get back successfully from highly adverse situations with the help of positivity in adapting to the barriers in life. Maladaptive behavior on the other hand refers to a person's ability to adjust to certain situations where in the result tend to be non productive and one which adds negativity to the persons character. The adolescence period has been christened by some psychologists as a period of 'storm and stress' and the period of drastic changes that occur in the life of the individual if not checked, may result in maladaptive behaviours. (Okobia & Ohen 2006; Oladele,1998) Adolescents' tend to solve problem by themselves without thinking much about the consequences it can bring about.

Maladaptive behaviours include cheating, examination malpractice, drug abuse, aggression, bullying, fighting, and so on. It affects the smooth functioning of the mind and spoils the day to day affairs of the affected person. This has become a regular feature of adolescents at school level.

A “resilient mindset” as Brooks and Goldstein (2001) states is that which can help adolescents to get back to normal life when succumbed to maladaptive behaviours. In a world which is fast paced, the amount of pressure it can bring is immense, getting maladapted usually becomes the way of life, here the need to inculcate resilience becomes more than essential. A resilient mind will be able to deal with maladaptive behaviours effectively. The adolescents at higher secondary school level being at the fag end of their school lives are getting ready to come out into a ‘sick hurry, divided aims’ world where they get least opportunity to correct their behavior. So it is very much essential to cultivate resilience in them, which in turn helps them to reduce their maladaptive behaviours. Hence the investigator decided to study the resilience and maladaptive behaviours among adolescents at higher secondary school level.

II. OBJECTIVES

1. To find out the resilience and maladaptive behaviours of adolescents at higher secondary school level.
2. To find out whether the adolescents at higher secondary school level differ in their resilience based on a) Gender and b) Locale
3. To find out whether the adolescents at higher secondary school level differ in their maladaptive behaviours based on a) Gender and b) Locale
4. To find out the relationship between resilience and maladaptive behaviours of adolescents at higher secondary school level.

III. METHODOLOGY

The normative survey method was adopted for the study. The population comprised of 300 higher secondary school adolescents of Kollam District, Kerala, India. Stratified random sampling technique was used for the study. The tools used were ‘Resilience Check Scale’ and ‘Maladaptive behaviours Check Scale’ which were prepared and standardized by the Investigator. Computation of percentages, critical ratio and coefficient of correlation were performed as a part of statistical data analysis of the present study.

IV. RESULTS AND DISCUSSION

To find out the resilience and maladaptive behaviours of adolescents at higher secondary school level, the adolescents were classified based on the scores as High, Average and Low in Resilience and High, Average and Low in maladaptive behaviours as shown in Table 1.

Table 1: Classification of Adolescents

Variables	Group	Scores	% of Adolescents
	High	M+SD=124&above	20

Resilience	Average	Between M+SD and M-SD=106-123	64
	Low	M-SD= below106	16
Maladaptive behaviours	High	M+SD=101&above	11
	Average	Between M+SD and M-SD=74-100	77
	Low	M-SD= Below74	12

From Table 1 it is clear that only (20%) of adolescents have high resilience, majority of them (64%) are average in resilience and (16%) are low in resilience. When it comes to maladaptive behaviours (11%) of adolescents have high maladaptive behaviours, while majority of them (77%) have average maladaptive behaviours and only (12%) have low maladaptive behaviours.

► Comparison of Resilience among different Sub-groups

Table 2: Test of significance of the difference between the means of resilience among different sub-groups based on gender and locality of schools

Groups	Subgroups	Number of Adolescents	Mean	SD	Critical Ratio
Gender	Male	140	118.79	7.07	6.89
	Female	160	112.06	9.45	
Locale	Urban	150	115.51	8.95	0.59
	Rural	150	114.89	9.18	

The mean and standard deviation of resilience in male adolescent's are 118.79 and 7.07 and that of female adolescents are 112.06 and 9.45 respectively. The critical ratio obtained is 6.8 which is higher than the value set for significance, i.e., 2.58 at 0.01 level and 1.96 at 0.05 levels. It indicates that there is significant difference between the mean and resilience of male and female adolescents.

The mean and standard deviation of resilience in urban adolescents are 115.51 and 8.95 and that of rural adolescents are 114.89 and 9.18 respectively. The critical ratio obtained is 0.59 which is lower than the value set for significance, i.e., 2.58 at 0.01 level and 1.96 at 0.05 levels. It indicates that there is no significant difference between the mean and resilience of urban and rural adolescents.

► Comparison of maladaptive behaviours among different Sub-groups

Table 3: Test of significance of the difference between the means of maladaptive behaviours among different sub-groups based on gender and locality of schools

Groups	Subgroups	Number of Adolescents	Mean	SD	CR
Gender	Male	140	80.50	9.80	8.68
	Female	160	92.20	13.04	
Locale	Urban	150	84.51	11.07	3.01
	Rural	150	88.97	14.39	

The mean and standard deviation of maladaptive behaviours in Female adolescents are 92.20 and 13.04 respectively which is higher than the mean and standard deviation of maladaptive behaviours in male adolescents which are 80.50 and 9.80 respectively. The

critical ratio obtained is 8.68 which is higher than the value set for significance, i.e., 2.58 at 0.01 level. It indicates that there is significant difference between the mean maladaptive behaviours scores of male and female adolescents at higher secondary school level.

The mean and standard deviation of maladaptive behaviours in rural adolescents are 88.97 and 14.39 respectively which is higher than the mean and standard deviation of maladaptive behaviours in urban adolescents which are 84.51 and 11.07 respectively. The critical ratio obtained is 3.01 which is higher than the value set for significance, i.e., 2.58 at 0.01 level. It indicates that there is significant difference between the mean maladaptive behaviours scores of urban and rural adolescents at higher secondary school level.

To study the relationship between Resilience and Maladaptive behaviours of adolescents at Higher Secondary school level the correlation between the two was calculated and the result thus obtained is shown in Table 4.

► **Relationship between Resilience and maladaptive behaviours of Adolescents at Higher Secondary School Level**

Table 4 : Result of correlation between resilience and maladaptive behaviours among adolescents at higher secondary level

Variables	N	Coefficient of correlation	t-value
Resilience & Maladaptive behaviours	300	-.717	24.03

**** $p < 0.01$**

Table 4 shows that the coefficient of correlation between resilience and maladaptive behaviours among adolescents at higher secondary school level is -.717. The t obtained is 24.03 which is greater than the table value 2.58. Hence the relationship is significant at 0.01 levels. So it can be concluded that there is significant negative correlation between resilience and maladaptive behaviours of adolescents at higher secondary school level.

V. CONCLUSION

Based on the findings of the present study the following conclusions are drawn. Very few adolescents at Higher Secondary level are found to have high Resilience and majority of the adolescents come under the average category. The same is applicable to maladaptive behaviours too. Most of the adolescents come under the average category. Hence it is necessary to take appropriate steps to build resilience and possible steps to reduce maladaptive behaviours of the adolescents. Studies based on resilience gave emphasis to identify and facilitate positivity than negativity in children while in adverse situations (Luthar, 2006). This throws light into the role that resilience can play to bring about a change in the attitude of adolescents that helps in reducing maladaptive behaviours.

VI. EDUCATIONAL IMPLICATION

The purpose of the present study was to understand the impact of resilience on maladaptive behaviours among adolescents at higher secondary school level and the study did reveal that resilience has a great impact on maladaptive behaviours and vice versa. The study revealed that there is high negative relationship between resilience and maladaptive behaviours. This

emphasises the role of resilience in reducing the maladaptive behaviours of the adolescents at higher secondary level. The study throws light on the need to inculcate in the adolescents resilience, which help them to become composed individuals. This study and the findings related to it may serve as a basement for further research in this area.

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Financial Derivative Use in Top Corporate Entities in India- A Trend Analysis

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1st

Dr. Suprava Sahu

Assistant Professor
Department of Commerce
Ravenshaw University
Cuttack, Odisha, India

2nd

Abhimanyu Sahoo

Abstract

Risk is one of the essential element of modern business and economic variable and maintains a positive correlation with profitability and performance. In the proposed work, it has been planned to search the answer for some important questions like attitude of commercial entities to use derivative advantageously as one of the effective alternative for risk management and the scope of these derivatives instruments in this regard. The study shows that there is a significant increase in the propensity to use financial derivative in regard to top performing companies of India.

I. REVIEW OF LITERATURE

Researchers during the past two decades have endeavoured to explore the purpose of risk management.

- i.) **Smith and Stultz (1985)¹, Smith (1995) and Stultz (1996)** have observed that hedging could increase firm value when (i) there are expected costs from financial distress, and (ii) there are agency problems.
- ii.) **Froot et al. (1993)²** developed a general framework for analyzing corporate risk management policies. They observed that if external sources of finance were more costly to corporations than internally generated funds, then there would typically be a benefit in hedging. Hedging adds value to the extent that it helps to ensure that a corporation has sufficient internal funds available to take advantage of attractive investment opportunities.

¹ Clifford W. Smith and René M. Stulz (1985). The Determinants of Firms' Hedging Policies. Journal of Financial and Quantitative Analysis, 20, pp 391-405. doi:10.2307/2330757.

² Froot, K., Scharfstein, D., & Stein, J. (1993). Risk Management: Coordinating Corporate Investment and Financing Policies. The Journal of Finance, 48(5), 1629-1658. doi:1. Retrieved from <http://www.jstor.org/stable/2329062> doi:1

- iii.) **Mitchell A. Petersen and S. RamuThaigarajan, (1997)³**, Their analysis states the diversity of risk management objectives that a firm may pursue. They had justified that risk management is necessary for hedging the asset values and cash flows. But different risk management strategies like derivatives, operational structure and financial structure can be applied targeting different areas of risk like cash flows, accounting inflow and equity values etc.
- iv.) **Fok et al. (1997)⁴** have reported that although the primary purpose of hedging is to reduce earnings volatility, it may also increase firm value. Their study shows that hedging reduces the probability of financial distress, the agency costs of debt, and the costs of equity. In addition, they suggested that corporate ownership structure might affect the desirability of hedging. They also found that large firms had a stronger tendency to hedge, firms with a larger percentage of value derived from growth opportunities were more likely to hedge, and convertible debt served as a substitute for corporate hedging.
- v.) **Bodnar and Gebhardt (1998)⁵** carried out a comparative study of the responses to the survey of derivative usage between the US and German nonfinancial firms. Their study shows that German firms are more likely to use derivatives than US firms. Apart from this higher overall usage, the general pattern of usage across industry and size groupings is comparable across the two countries. In both countries, foreign currency derivative usage is most common, followed closely by interest rate derivatives, with commodity derivatives a distant third. In contrast to the similarities, firms in the two countries differ notably on issues such as the primary goal of hedging, their choice of instruments, and the influence of their market view when taking derivative positions.
- vi.) These differences appear to be driven by the greater importance of financial accounting statements in Germany than the US and stricter German corporate policies of control over derivative activities within the firm.
- vii.) The survey study of **Yadav, Jain (2000) and Rastogi** based on 44 corporate firms in India has shown that the Indian companies involved in international operations are conscious of the unique risks that arise as a result of doing business abroad. They report that companies are taking steps to manage political risk, exchange rate risk and interest rate risk. They observe that companies are covering a good part of their exchange rate risk and as many as 30 per cent of companies hedge their exposures in totality.

³ Petersen, M. A., &Thiagarajan, S. R. (2000). Risk Measurement and Hedging: With and Without Derivatives. Financial Management, 29, 5-30.

⁴Fok, C., Carolyn, C., and Ming, C. (1997). Determinants of Corporate Hedging and Derivatives: A Revisit, Journal of Economics and Business, 49, 569-585.

⁵ Bodnar, Gordon M. and Gunther Gebhardt. "Derivatives Usage In Risk Management By US And German Non-Financial Firms: A Comparative Study," Journal of International Financial Management and Accounting, 1999, v10(3,Autumn), 153-187. (DOI): 10.3386/w6705

- viii.) **Marshall et al. (1999)**⁶ revealed that there were statistically significant regional differences in the importance and objectives of risk management. The study concluded that, in general, UK and USA multinational corporations (MNCs) had similar policies, with a few notable exceptions; however, Asian Pacific MNCs had displayed significant differences.
- ix.) **Loderer and Pichler (2000)**⁷ surveyed was examine the risk management policies of industrial firms. They expected that they estimate the risk profile of firm value (or at least that of their operating cash flow) and hedge/insure it with derivative securities. That is not what they found. Firms appear to rely on operating tools both actively and reactively to protect against currency risk. Currency derivatives are used mainly to microhedge/microinsure transaction exposure.
- x.) **Joseph (2000)**⁸ has studied the relationship between the use of hedging techniques and the characteristics of UK multinational enterprises. The study indicates that firms are not very receptive to the newer and more complex types of derivatives.
- xi.) **Allayannis et al. (2001)**⁹ have examined the exchange rate hedging practices of firms that hedged foreign debt exposure in eight East-Asian (EA) countries between 1996 and 1998. In contrast to studies of US firms, they found limited support for existing theories of optimal hedging. Instead, they found that firms used foreign earnings as a substitute for hedging with derivatives and provided evidence that EA firms were engaged in 'selective' hedging. They found no evidence that EA firms eliminated their foreign exchange exposure by using derivatives.
- xii.) **Oosterhof (2001)** has suggested that corporate risk management and hedging are important activities within financial as well as non-financial corporations. The study concluded that the major determinant of derivatives' use is firm size. The mixed results indicate that corporate risk managers, willingly or unwillingly, do not behave in an optimal way. Fatemi and Luft (2002) established that risk management strategies should be pursued to enhance shareholder value. The empirical evidence cited was supportive of the notion that the strongest motive for risk management behavior was the avoidance of financial distress.
- xiii.) **Belk (2002)** studied the organization of foreign exchange risk management among the multinational corporations in the UK, the US and Germany. He concluded that companies were generally risk-averse and the goals of currency risk management were not clearly formulated.

⁶Hunter, W. C., & Marshall, D. (1999). Thoughts on Financial Derivatives, Systematic Risk, and Central Banking: A Review of Some Recent Developments. Working Paper, The Federal Reserve Bank of Chicago.

⁷ Pichler, Karl and Loderer, Claudio F., Firms, Do You Know Your Currency Risk Exposure? Survey Results (January 5, 2000). Available at SSRN: <http://ssrn.com/abstract=203151> or <http://dx.doi.org/10.2139/ssrn.203151>

⁸ Joseph Mariathan, (2000), "The use of derivatives by insurance companies", Balance Sheet, Vol. 8 Iss 1 pp. 29 – 32. Permanent link to this document: <http://dx.doi.org/10.1108/09657960010338454>

⁹Allayannis, G., Weston, J., 2001. The Use of Foreign Currency Derivatives and Firm Market Value, Review of Financial Studies 14, 243-276.

- xiv.) **Bodnar et al. (2003)**¹⁰ examined the influence of institutional differences on corporate risk management practices in the US and the Netherlands. Their study shows that institutional differences appear to have an important impact on risk management practices and derivatives use across US firms and Dutch firms.
- xv.) **Pramborg (2005)**¹¹ compared the hedging practices of Swedish and Korean non-financial firms. The findings suggested that the objective of hedging differed among firms in the two countries. Korean firms mostly focused on reducing fluctuations in cash flows, while Swedish firms more commonly emphasized reducing fluctuations of accounting numbers. Saito and Schiozer (2005) presented evidence on derivatives usage by Brazilian non-financial firms, using a sample of 74 companies.
- xvi.) **Kingsley Fong, David R., (2005)**¹² observed a dramatic shift in the nature of risk in global financial markets and increased volatility of many asset classes. As investors are continuously exposed to a broad range of dynamic risks, derivatives have become a valuable tool in the risk management practices of institutions. Despite the potential for derivative instruments to effectively manage the risks faced by institutions, public opinion concerning these securities suggests the general public view derivative securities as inherently dangerous. Anecdotes such as Long-Term Capital Management (LTCM) in the U.S., Barings Bank in the U.K., highlight the potential hazards of derivative use, and have attracted the close attention of risk management executives, investors, governments, market regulators, as well as the media.
- xvii.) **Udo Broll, B. Michael Gilroy and Elmar Lukas, (2005)**¹⁵ explains that credit derivatives are an important financial instrument in which banks and financial intermediaries, without transferring their portfolio or reducing their portfolio concentration, can buy into their risk of each other. The bartering of risk in such bilateral transactions is enforced through marketable contracts. The credit risk inherent in a portfolio can be securitized and sold in the capital market like any other capital market security. The important underlying economic insight hereby is that the concept of credit derivatives and securitization have joined together to make risk a tradable commodity enhancing the usage of viable hedging strategies.
- xviii.) **Dick Bryan and Michael Rafferty (2007)**¹³ had identified that what makes derivatives so exceptional for risk management is that they are cheap: they are products which give exposure to risk (price or index changes) but without having to own any of the underlying assets from which the risk derives. In this sense,

¹⁰ Bodnar, Gordon M. and de Jong, Abe and Macrae, Victor, The Impact of Institutional Differences on Derivatives Usage: A Comparative Study of US and Dutch Firms. *European Financial Management*, Vol. 9, pp. 271-297, September 2003. Available at SSRN: <http://ssrn.com/abstract=423630>

¹¹ Pramborg (2005); Foreign exchange risk management by Swedish and Korean nonfinancial firms: A comparative survey; *Pacific-Basin Finance Journal*, Volume 13, Issue 3, Pages 343-366

¹² Fong, K., Gallagher, D. R., & Ng, A. (2005). The use of derivatives by investment managers and implications for portfolio performance and risk. *International Review of Finance*, 5(1-2), 1-29.

¹³ Bryan, D., & Rafferty, M. (2007). Capitalism with derivatives: A political economy of financial derivatives, capital and class.

derivatives are commodified risk. You can buy (or sell) exposure to movements in the value of wheat without having to buy (or sell) any wheat, movements in the value of the dollar without trading dollars themselves. The derivative contracts which generate these possibilities carry a large risk exposure for relatively little expenditure. All your risk management expenditure is dedicated to the single phenomenon of risk exposure.. In expectation of an oil price increase, you could buy one barrel of oil for \$50, store it and wait. Or you could buy an oil derivative which gives exposure to the same price movement per barrel of oil for just a couple of dollars. Put another way, for the price of one barrel of oil, derivatives give exposure to price movements on twenty-five barrels. Compared with the buying-oil-storing-it-and-waiting strategy, derivatives provide ‘leverage’ and reduce the costs of hedging against unwanted price movements. As a consequence they also cheapen the cost of speculating on price movements.

- xix.) **Donald Lien and Mei Zhang (2008)** described that despite growth over the past years, the notional outstanding amounts in derivatives markets is fairly small in emerging market economies compared to matured markets. As for the function of derivatives markets, academic research infers how emerging derivatives markets fulfil their functions of risk reduction and redistribution and price discovery and stabilization, compared to what has occurred in mature markets. The studies support the hedging role of emerging derivatives markets. Research on optimal hedging strategies reveals the effects of emerging market factors on the formulation and implementation of the optimal hedging ratio. Such factors could include, among others, uncertainty of the existence of currency risk and management of multiple risks. Empirical studies on the futures markets in a few emerging countries suggest a price discovery function of these markets. On the other hand, research showed mixed results on the price- stabilization function of emerging derivatives markets.
- xx.) **Kevin Aretz and Sohnke M. Bartram(2009)**¹⁴Thier comprehensive review of existing empirical evidence supported the use of derivatives for corporate risk management. The results are consistent with use of derivative as one part of the broader financial strategy that considers the type and level of financial risks, the availability of risk management tools and the operating environment of the business entity. They have also identified that pass-through; operational hedging and foreign currency debt are also important dimensions of firms’ hedging strategies with derivatives possibly playing mostly a fine tune role. Attached to the same currency in which its revenues are denominated). Some evidence shows that this natural currency hedge increases foreign debt capacity and reduces the magnitude of derivative holdings for risk management purposes. Firms that benefit from local currency devaluation (e.g., exporters) hold smaller derivatives portfolios than firms

¹⁴ Aretz, K., & Bartram, S. M. (2010). Corporate hedging and shareholder value. *Journal of Financial Research*, 33(4), 317-371.

with operational results that are negatively affected by or not sensitive to currency devaluation.

- xxi.) **P.K. Jain, Surendra S. Yadav and Ashish Kumar Rastogi (2009)**¹⁵ identified that the use of risk management techniques and instruments live derivatives by corporate firms in India is hindered by a number of barriers. These included (i) monitoring and evaluating the risk of derivatives, pricing, valuing and accounting and (ii) credit and liquidity risks. Transaction costs are also a significant barrier and some firms may find it expensive to invest in necessary technology and human resources. With dismantling of trade barriers, the international transactions are likely to increase, warranting greater importance for risk management. The popularity of risk management is not yet high and many firms in India do not manage all types of risks, albeit significant advances have been made by some of them. From the financial literature, it is easy to comprehend that risk affects all the facets of a company's operations. Nowadays, shareholders and stakeholders increasingly expect management to be able to identify and manage risks.
- xxii.) **Dubravko Mihaljek and Frank Packer (2010)**¹⁶ had identified that the growth of derivatives turnover in emerging markets remains more rapid than in advanced economies. The largest emerging market derivatives markets are now located in Korea, Brazil and the two Asian financial centres of Hong Kong and Singapore. About half of the derivatives turnover in emerging markets occurs over the counter, compared to one third in advanced economies. FX derivatives are by far the most commonly traded. Growth of FX derivatives turnover appears to be positively related to trade, financial activity and per capita GDP. Derivatives turnover in emerging markets is becoming more and more global. Not only is an increasing share of emerging market transactions cross border as opposed to domestic, but the two large financial centres of emerging Asia continue to grow in importance as home to an increasingly large share of OTC derivatives trades not involving the local currency.
- xxiii.) **Tai-yuen HON, (2012)**¹⁷ made the study to identify the ways the Hong Kong companies in the Hang Seng Index Constituent Stocks manage their financial risks with derivatives. Among the 46 companies that he studied, 38 of them (or 82.6%) reported that they used at least one derivative if and when the need arises. Obviously, it was popular for these Hong Kong large companies to manage their financial risks using derivatives. He also stated the variation in the use of derivatives among different sectors. For example, in the finance and utilities sectors, 100% of the companies reported that they used at least one derivative. The corresponding

¹⁵ Jain, P. K., Yadav, S. S., & Rastogi, A. K. (2009). Risk Management Practices of Corporate Firms in India: A Comparative Study of Public Sector, Private Sector Business Houses and Foreign Controlled Firms. Decision (0304-0941), 36(2).

¹⁶ Mihaljek, D., & Packer, F. (2010). Derivatives in emerging markets. BIS Quarterly Review, December.

¹⁷ Hon, T. (2012). Managing Financial Risk by Using Derivatives: A Study of Hong Kong Listed Companies. Journal of Economics, 3(2), 238-246.

figures for the commerce and industry sector and properties sector are 78.3% and 57.1% respectively. In view of the global financial crisis, the Hong Kong companies have been concerning about interest rate risk and foreign exchange risk. To deal with the former, 58.7% of the companies reported that they used interest rate swaps, followed by options (10.9%), forward rate agreements (FRA) (10.9%) and interest rate futures (6.5%). To deal with the latter, 56.5% of the companies used forward contracts, followed by swaps (43.5%), options (13%), futures (6.5%), and non-deliverable forward (NDF) (2.2%). Also the companies preferred using interest rate swaps to hedge interest rate risk and using forward contracts to hedge foreign exchange rate. In general, there is a trend for large firms in Hong Kong to use derivatives for managing the financial risks. Some of them even have written policies on using derivatives. The majority of these companies also have clear objectives, including foreign exchange objectives and interest rate objectives.

xxiv.) **Olajide Solomon Fadun, (2013)²³** advocated that derivatives provide an opportunity to transfer risk from the one who wish to avoid it, to one who wish to accept it. The paper examines risks associated with the FSS and the suitability of derivatives to manage these risks in Nigeria. The FSS is an important parts of a country financial system, hence the necessity to effectively manage risks associated with the sector's activity. The study identifies risks associated with FSS operations. It also explores derivatives market, products and participants to facilitate thorough understanding and workability of derivatives markets. The study findings suggest that: derivatives products are suitable for managing FSS risk exposures; derivatives provides huge economic benefits to a nation, if properly engaged; and, the development of derivatives market in Nigeria is necessary to enhance liquidity and mobilise the required capital for economy growth.

xxv.) **Håkan Jankensgård, Kilian Hoffman and Diana Rahmat, (2014)¹⁸** have the following findings that risk disclosure is generally regarded as crucial in order for investors to make informed decisions in the resource allocation process. While previous research has indicated that market risk disclosures are useful in predicting future levels of risk, this study is the first to empirically investigate the value-relevance of risk disclosure. They focus on the disclosure of foreign exchange (FX) risk, which is an area that previous research has identified as value-relevant, while it is also notorious for its lack of transparency. According to them the basic prediction of the literature on voluntary disclosure, a higher level of disclosure should lead to lower information asymmetries, lower cost of capital, and higher firm value. But their empirical analysis involving a FX risk disclosure index for a sample of 183 Swedish firms suggests the opposite is true: holding the level of derivative usage constant, Tobin's Q decreases in the level of FX risk disclosure.

¹⁸Jankensgård, H., Hoffmann, K., & Rahmat, D. (2014). Derivative Usage, Risk Disclosure, and Firm Value. Journal of Accounting and Finance, 14(5), 159.

- xxvi.) **Gordon M. Bodnar et al, (2015)¹⁹** surveyed CFOs of public and private sector firms all over the world in early 2010 but their findings were inconsistent with the existing theory that fundamental corporate objectives such as cash flow volatility or shareholders' interest seem behind the reason why firm hedge.
- xxvii.) **Sahoo, A. (2015)²⁰** reviewing various literature from 1986 to 2015 suggest that the financial derivatives have become a celebrated and handy corporate risk management instrument in the western world. Many studies confirmed that the size effect hypothesis also applies to the use of financial derivatives which means larger firms tend to use more derivatives in comparison to relatively smaller firms. It has also been found that there exists a positive relationship between presence of external debt or liability and use of derivatives. But review shows that there is a negative correlation between liquidity and propensity to use derivatives. Studies also suggest that the foreign currency, interest rate and commodity price risks are the most common risks hedged by the derivative instruments. **Sahoo, A. (2015)²¹** observed that India's tryst with derivatives began in 2000 when both the NSE and the BSE commenced trading in equity derivatives. In June 2000, index futures became the first type of derivatives instruments to be launched in the Indian markets, followed by index options in June 2001, options in individual stocks in July 2001, and futures in single stock derivatives in November 2001. Since then, equity derivatives have come a long way. New products, an expanding list of eligible investors, rising volumes, and the best risk management framework for exchange-traded derivatives have been the hallmark of the journey of equity derivatives in India so far. **Sahoo, A. (2016)²²** concluded that forwards and swaps are by far the most important derivative instruments in India. Futures as representatives of standardised derivatives are the next best alternative of risk management tool for the Indian companies. Foreign currency risk is the most widely hedged risk through derivatives in Indian economy whereas the international derivative outstanding position reveals that interest rate risk holds the largest chunk of the total derivative exposures. The industry classification states that information technology is the sector where highest proportion derivative use is recorded.

II. RESEARCH GAP

The review observes a serious gap in the area of risk management practices by use of derivative practices of Indian firms, hence calls for further research in the area.

¹⁹Bodnar, G. M., Giambona, E., Graham, J. R., & Harvey, C. R. (2015). A view inside corporate risk management. Available at SSRN 2438884.

²⁰ Sahoo, A. (2015). Corporate risk management through financial derivatives: a review of literature. *International Journal of Advanced Research in Management and Social Sciences*, 4(8), 200-233.

²¹ Sahoo, A. Derivative and Risk Management: A New Dimension of Indian Financial Market. *Asian Journal of Technology & Management Research [ISSN: 2249-0892]*, 5(2).

²² Sahoo, A. (2016). Pattern of Corporate Hedging Through Financial Derivatives in Non-Financial Companies of India. *Journal of Commerce and Management Thought*, 7(3), 444.

Liberalization and globalization of the Indian economy resulting in industrial growth, liberalization of trade regulations and emergence of new risk management techniques in corporate finance have provided new opportunities for managing risks. An empirical research is expected to provide insight into the practices and behaviour of the corporate enterprises in India. The study related to the risk management practices assumes greater significance now than ever before, because of various global phenomenon during the preceding one decade when not only India but the whole world has undergone substantial and first changing volatilities in every sphere including economic, social, regional, security and political issues.

The literature survey confirms that the existing studies in the area of risk management practices have not covered important aspects like *“Risks(Concerns) and side effects of the use of risk management tools such as financial derivatives in India and an exploratory and comparative analysis of the approach and attitude of risk management through derivatives between public(Govt.) and private Indian Inc. Another important aspect proposed to be covered is the cost benefit analysis of use of derivatives.”*

III. STATEMENT OF PROBLEM

The main research problem for the study is **“What is the degree and extent of use of derivatives by Indian companies for risk management purposes?”**

IV. RESEARCH OBJECTIVES

The main objective of the study is to explore facts in the following regards:

1. Which derivatives are used, and which type of exposure they are used for;
2. Degree and extent of use of financial derivatives;
3. Factors of concern in derivatives usage

V. RESEARCH HYPOTHESIS

The following Hypothesis are framed after careful studies of the related literature:

H₀₁: There is a significant increase in use of financial derivatives for risk management purpose by Indian corporates.

VI. SIGNIFICANCE OF THE STUDY

The available literature consists of examples of corporate practices of firms from western countries in relation to risk management using various engineered instruments (Derivatives). There is not much study of the overall approach and strategy of risk management that is being implemented by the managers of the firms in India through derivatives. On this backdrop, it has been planned to give a sincere effort to unearth and divulge new facts on various and diversified aspects of use of derivatives as stated in the research objectives.

VII. RESEARCH METHODOLOGY

Though the topic has become popular now-a-days, still there are many areas which have remained uncovered in the Indian context and requires further investigations e.g. Indian

corporate hedging pattern through risk management, concerns and side effects of risk management through derivatives, risk management through exotic derivatives, difference in perception risk and their square up by suitable hedging through appropriate derivative instruments of public (Govt.) and private sector companies. Therefore, to explore new vistas in the field of use of derivatives, a descriptive and exploratory study is undertaken on 100 small and large companies including companies taken from SENSEX-30 or NIFTY-50 indices for consideration.

• SOURCES AND METHODS OF DATA COLLECTION

Primarily, secondary data is proposed to be used for the research work. Secondary data are collected from annual reports, articles of financial research journals, reference books on derivatives, business magazines, daily business/ financial newspapers, internet etc.

• STATISTICAL TOOL

The study will be conducted over a period of 5 years, means from the year 2011 to 2015. Data to be collected from various sources will be analysed with the help of statistical software like SPSS, EXCEL SPREAD SHEETS etc. and statistical tools. Tables, charts, and graphs will be used to present the required data. Statistical tools like percentage, average, standard deviation, t-test, chi-square test, ANOVA are used for analysis of data.

VIII. DATA ANALYSIS

We have tried to decipher the trend of derivative use in Indian context starting with the analysing the previous literature analysis and followed by classification of companies into various industries and thereafter analysing classified industry data to get an insight into the pattern of derivative in different major sectors of the economy.

Table-1: Empirical Evidence of Use of Derivatives

Study	Country	Year	Sample Size	No. of Responses	Response Rate	% of Users
Block and Gallagher	USA	1986	500	193	38.6%	20
Dolde	USA	1993	500	244	48.8	85
Bodner et al	USA	1994	2000	530	26.5	35
Bodner et al	USA	1995	2000	350	17.5	41
Bodner et al	USA	1998	1928	339	20.7	50
Phillips	USA	1995	3480	657	18.9	63.2
Grant and Marshall	UK	1995	500	146	29.2	90.2
Alkebach and Hagelin	Sweden	1996	213	163	76.5	51.5
Jalilvand et al	Canada	1996	548	154	28.1	75
Berkman et al	New Zealand	1997	124	79	63.7	53.1
Bodnar and Gebhardt	Germany	1997	368	126	34.2	77.8
Khim and Liang	Singapore	1997	1000	260	26.0	35.4
Fatemi and Glaum	Germany	1998	153	71	46.4	88
Ceuster et al	Belgium	1997	334	73	21.9	65
Lee et al	UK, US, Asia-Pacific	1998	600	179	39.5	29.83

Benson and Oliver	Australia	2000	429	100	23.3	76
Mallin et al.	UK	2001	800	495	63.59	62.1
El-Masry	UK	2003	401	173	43.14	67
Anand and Kaushik	India	2008	640	55	8.6	83.6
Paligorova and Staskow	Canada	2014	1522	N.A	N.A	33
Present Study	India	2015	433	N.A	N.A	68.53

Table-2: Global Usage of Derivatives

Country	% of Users
United Kingdom	92.70
Germany	88.00
Australia	76.00
Canada	75.00
Belgium	65.80
India	61.20
New Zealand	53.00
United States of America	50.00

Table-3: Industry Classification of Sampled Firms on the basis of year 2014-15

Sector	No. of Firms	% of Sample	No. of Users	% of Users
Automobiles & Auto Components	31	7.16*	22	70.97 [#]
Conglomerate	13	3.00	10	76.92
Consumer Durables	17	3.93	13	76.47
Energy, Power & Equipment	44	10.16	27	61.36
Fast Moving Consumer Goods	46	10.62	33	71.74
Fertilizers & Agricultural Chemicals	15	3.46	10	66.67
Health, Pharmaceuticals & Biotechnology	25	5.77	14	56.00
Industrials & Engineering	69	15.94	41	59.42
Information Technology	26	6.00	20	76.92
Infra, Real Estate & Construction Materials	53	12.24	23	43.40
Leisure and Entertainment	11	2.54	6	54.55
Metals & Mining	23	5.31	13	56.52
Telecom Services	9	2.08	5	55.56
Textiles, Apparels & Jewelleries	33	7.62	23	69.70
Transport Services	18	4.16	5	27.78
Sample	433	100	265	61.20

The above table shows the classified industry analysis with regard to degree and pattern of derivative use and it is very evident from the table that information technology, conglomerate and consumer durables are the sectors which are the industry leaders in terms of proportion of derivative users in the sampled companies belonging to that sector.

Similarly, transport sector is the least user of derivative instruments for risk management purpose.

Table-4: Proportion of Use of Derivatives—by Size

Sales Group*	Number (% of Total)	Users (% of Number)	Non-users (% of Number)
More than ₹500 billion	22 (5.08 %)	19 (86.36 %)	3 (13.64 %)
₹400 - ₹500 billion	4 (0.92 %)	3 (75.00 %)	1 (25.00 %)
₹300 - ₹400 billion	12 (2.77 %)	9 (58.33 %)	3 (41.67 %)
₹200 - ₹300 billion	14 (3.23 %)	10 (71.43 %)	4 (28.57 %)
₹100 - ₹200 billion	41 (9.47 %)	28 (68.29 %)	13 (31.71 %)
₹50 - ₹100 billion	76 (17.55 %)	51 (67.11 %)	25 (32.89 %)
₹40- ₹50 billion	32 (7.39 %)	23 (71.88 %)	9 (28.12 %)
₹30- ₹40 billion	52 (12.01 %)	30 (57.69 %)	22 (42.31 %)
₹20- ₹30 billion	98 (22.63 %)	55 (56.12 %)	43 (43.88 %)
₹10- ₹20 billion	74 (17.09 %)	36 (48.65 %)	38 (51.35 %)
Less than ₹10 billion	8 (1.85 %)	1 (12.5 %)	7 (87.50 %)

**Grouping has been made on the basis of sales of the year 2014-15*

The findings on the basis of classifying the companies into different classes of size in terms of the sales revenue of the period 2015-16, it is very clear that the large sized companies are more aggressive in terms of hedging through derivatives in comparison to their smaller counterpart. The data analysis in table-4 shows that large sized companies in the sale group of ₹500 billion are highest percentage (86.36%) of derivative users whereas it is lowest in small sized companies.

Table-5: Year-end Exposure (Risk-wise)

Year		Total	Currency	Interest Rate	Commodity
2014-15	No. of Users	265	226	90	19
	Year-end Exposure (in Cr.)	638957.89	469872.8146	154732.6353	14352.43676
	% of Total Exposure	100%	73.54%	24.22%	2.25%
2013-14	No. of Users	252	217	90	16
	Year-end Exposure (in Cr.)	540173.74	395010.631	132002.8671	13160.23756
	% of Total Exposure	100%	73.13%	24.44%	2.44%

2012-13	No. of Users	247	206	85	15
	Year-end Exposure (in Cr.)	512445.39	375278.721	125169.1524	11997.51831
	% of Total Exposure	100%	73.23%	24.43%	2.34%
2011-12	No. of Users	244	201	81	13
	Year-end Exposure (in Cr.)	499832.43	370010.118	119582.7349	10239.57824
	% of Total Exposure	100%	74.03%	23.92%	2.05%
2010-11	No. of Users	231	195	80	13
	Year-end Exposure (in Cr.)	467159.58	355253.863	102525.8671	9379.84724
	% of Total Exposure	100%	76.05%	21.95%	2.01%
Average Growth in Amount of Derivative Use		8.30%	7.44%	10.90%	11.2%

The table-5 shows the incremental growth in the rate of use of derivatives over a period of five years from 2010-11 to 2014-15, where it is clearly evident that there is significant average annual growth in the in all variety of financial instruments taken in the study.

Table-6: Industry breakdown of currency, interest rate, and commodity derivatives use-2014-15

Industry	Total Sample	Currency		Interest Rate		Commodity	
		No. of Users	Year End Open Interest (₹)	No. of Users	Year End Open Interest (₹)	No. of Users	Year End Open Interest (₹)
Automobiles	31	20	26354.00	5	2919.90	1	67.90
Conglomerate	13	10	33635.20	4	1751.10	0	0.00
Consumer Durables	17	11	1041.10	3	389.90	1	116.20
Energy	44	23	149946.4	11	108349.7	8	11792.70
FMCG	46	28	27382.30	11	8803.70	3	774.30
Fertilizers	15	10	8872.80	6	1273.40	0	0.00
Health & Pharma	25	11	16139.92	6	2498.13	0	0.00
Industrials	69	36	45380.60	16	5629.80	2	472.20
IT	26	20	103895.2	1	934.09	0	0.00
Infra	53	12	5424.80	11	10566.60	2	365.90
Entertainment	11	5	1294.70	3	2320.90	0	0.00
Metals	23	11	26628.90	3	2100.30	2	762.90
Telecom	9	4	5315.00	4	5477.96	0	0.00
Textiles	33	21	15301.50	4	1439.10	0	0.00
Transport	18	4	3259.70	2	277.60	0	0.00
Total	433	226	469872.1	90	154732.1	19	14352.10

IX. HYPOTHESIS TESTING

On the basis of collected from the annual reports, it has been empirically tested to identify whether there is substantial and significant positive change in the use of financial

derivatives. For that, independent sample t-test has been used to contrast between the first year (2010-11) and last year (2014-15) of the sampling period. The test results given as follows:

H_{a1}: There is significant increase in use of financial derivatives over the sampling period.

Table-7: T-test for Equality of Means

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Derivatives Values	Equal variances	12.267	.000	2.660	864	.003
	Equal variances not assumed			2.660	641.868	.001

Before applying the t-test, it has to be made sure of the fact that whether the sample variances are equal or not. The result of t-test shows that there is a significant incremental difference (at $\alpha=5\%$) between the means of outstanding amount of derivatives for the sample year 2014-15 and 2010-11. The t-test provides substantial evidence about the fact that degree of usage of financial derivatives has increased over the years which is consistent with our research hypotheses (H_{a1}).

X. CONCLUSION

After liberalisation, Indian economy is now open for the world class competition. It forced the Indian corporate sector not only compete with the foreign competitors but also to adapt and enforce state of the art financial management concepts to be more competitive. In this back drop, financial derivative is an innovative financial instrument used to deal with an array of business risk. Our research is to know; how Indian firms are embracing the derivative use in risk management purposes. The result is quite encouraging. It happens to be the fact that there is a statistically significant increase in the use of derivatives over a period of five years and a substantial proportion of companies are using financial derivatives for risk management purposes. In the coming years, India will be one of the prominent derivative transaction destinations of the world.

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Design Analysis and Experimental Investigation of Brake Disc for Composite Materials

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1 st	Rahul Raosaheb Pind	M.S. Student Department of Mechanical Engineering Bidve Engineering College, Latur, Maharashtra, India
2 nd	Prof. Swami M. C.	Professor, Department of Mechanical Engineering Bidve Engineering College, Latur, Maharashtra, India
3 rd	Kusekar S.K.	Assistant Professor Department of Mechanical Engineering Zeal College of Engineering & Research, Pune, Maharashtra, India

Abstract

The study describes the design and finite element analysis of alternating material for brake rotor. The design and finite element analysis is performed by using computer aided design (CAD) software. The objective is to design and analyse the thermal and structural stress distribution of brake rotor at the real time condition during braking process. Transient thermos-elastic analysis of the Rotor Disc of Disk Brake is aimed at evaluating the performance of disc brake rotor of a bike under severe braking conditions and there by assist in disc rotor, design and analysis. In the present work, an attempt has been made to investigate the suitable hybrid composite material which is lighter than stainless steel 321 and has thermal strain, Yield strength and density properties. The optimization is carried out to reduce the stress concentration and weight of the brake rotor, which keeps the unsprung mass low thereby increasing the stability of the vehicle. With using computer, aided design (CAD), Catia v5 software the structural model of brake rotor is developed. Furthermore, the finite element analysis performed with using the software ANSYS 16. Aluminium base metal matrix composite, High Strength Glass Fiber and carbon fiber composites have a promising friction and wear behaviour as a Disk brake rotor. The transient thermos-elastic analysis of Disc brakes in repeated brake applications has been performed and the results were

compared. The prototype of composite brake disc was tested practically on the Honda Unicorn Bike. The suitable material for the braking operation is carbon fiber and all the values obtained from the analysis are less than their allowable values. Hence the brake Disc design is safe based on the strength and rigidity criteria. By identifying the true design features, the extended service life and long term stability is assured.

I. INTRODUCTION

The need of efficient use of energy & materials is being felt strongly because of diminishing resources in the present times. There has been an important role of materials in the development of civilizations. In the transportation sector when earlier large bulky automobiles are compared with today's lightweight, technologically superior vehicles. The continuously increasing demand for personal mobility has led automobile manufacturers to strive continuously for cheaper, more efficient and safer vehicles. These requirements are competing with respect to each other. However, the tough competition in today's automotive market forces vehicle manufacturers to strive for improvement in each of these fields.

To improve vehicle safety without the burden of increasing vehicle weight, more and more active safety features are introduced. However, the most critical part with respect to safety is, and has always been: the brake system. Due to its critical role, very high demands are imposed on the brake system with respect to reliability, durability and consistency in its behaviour. These severe demands have forced the brake system development in a rather conservative direction. Introducing drastically new technology is never completely free of risk and in brake system development; there is no room for mistakes. Therefore, the brakes on modern vehicles are an extreme optimization of a very old design.

1.1 Introduction to Composite Materials

Composite materials signify that two or more constituents are combined on microscopic scales to synthesize a useful material. A variety of materials can be combined on a microscopic scale. The advantage of the composite materials is that their individual constituents retain their characteristic unlike alloys. As a result, various combinations of useful properties, usually not attainable by alloys, can be obtained through composite materials by suitable tailoring the matrix and reinforcement [dispersoid]. The dispersoids/second phase particles may be either harder or softer than the matrix alloy and affect the properties of the composites accordingly. For e.g. softer dispersoids like graphite, talc, mica shell etc. impart solid lubricating properties wherein the total wear resistance of the material improves. In this case, other properties such as strength, hardness etc. of the composites is less than that of the matrix alloy. However, they have been found to be within acceptable limits as confirmed through some experiments. The reinforcement of hard ceramic particles like silicon carbide, alumina, silica, zircon etc. in aluminium alloys has been found to improve the wear resistance as well as high temperature strength properties. Types of Composite Materials The nature of the reinforcing phases and the matrix are the important factors on the basis of which composites are classified as:

- a) Fibre reinforced composite
- b) Whisker reinforced composite
- c) Particle reinforced composite
- d) Laminated composite

1.2 Problem Statement

Brakes are often described according to several characteristics including: Peak force - The peak force is the maximum decelerating effect that can be obtained. The peak force is often greater than the traction limit of the tires, in which case the brake can cause a wheel skid.

- Continuous power dissipation - Brakes typically get hot in use, and fail when the temperature gets too high. The greatest amount of power (energy per unit time) that can be dissipated through the brake without failure is the continuous power dissipation. Continuous power dissipation often depends on e.g., the temperature and speed of ambient cooling air. Fade - As a brake heats, it may become less effective, called brake fade. Some designs are inherently prone to fade, while other designs are relatively immune. Further, use considerations, such as cooling, often have a big effect on fade.

- Smoothness - A brake that is grabby, pulses, has chatter, or otherwise exerts varying brake force may lead to skids. For example, railroad wheels have little traction, and friction brakes without an anti-skid mechanism often lead to skids, which increases maintenance costs and leads to a "thump" feeling for riders inside.

- Power - Brakes are often described as "powerful" when a small human application force leads to a braking force that is higher than typical for other brakes in the same class. This notion of "powerful" does not relate to continuous power dissipation, and may be confusing in that a brake may be "powerful" and brake strongly with a gentle brake application, yet have lower (worse) peak force than a less "powerful" brake.

- Durability - Friction brakes have wear surfaces that must be renewed periodically. Wear surfaces include the brake shoes or pads, and also the brake disc or drum. There may be trade-offs, for example a wear surface that generates high peak force may also wear quickly.

- Weight - Brakes are often "added weight" in that they serve no other function. Further, brakes are often mounted on wheels, and unsprung weight can significantly hurt traction in some circumstances. "Weight" may mean the brake itself, or may include additional support structure.

- Noise - Brakes usually create some minor noise when applied, but often create squeal or grinding noises that are quite loud.

1.3 Objective

In automotive industries, to achieve reduced fuel consumption as well as greenhouse gas emission is a current issue of utmost importance. To reduce automobile weight and improve fuel efficiency, the auto industry has dramatically increased the use of aluminium in light vehicles in recent years. Aluminium alloy based metal matrix composites (MMCs) with

ceramic particulate reinforcement have shown great promise for such applications. These materials having a lower density and higher thermal conductivity as compared to the conventionally used gray cast irons are expected to result in weight reduction of up to 50 – 60 % in brake systems. Moreover, these advanced materials have the potential to perform better under severe service conditions like higher speed, higher load etc. which are increasingly being encountered in modern automobiles. Since brake disc or rotor is a crucial component from safety point of view, materials used for brake systems should have stable and reliable frictional and wear properties under varying conditions of load, velocity, temperature and environment, and high durability. There are several factors to be considered when selecting a brake disc material. The most important consideration is the ability of the brake disc material to withstand high friction and less abrasive wear. Another requirement is to withstand the high temperature that evolved due to friction. Weight, manufacturing process ability and cost are also important factors those are need to be considered during the design phase. In material selection stage, the recyclability of cast iron is advantageous but the evolution of CO during re-melting has to be taken in consideration. The brake disc must have enough thermal storage capacity to prevent distortion or cracking from thermal stress until the heat can be dissipated. This is not particularly important in a single stop but it is crucial in the case of repeated stops from high speed.

1.4 Methodology

The materials selection chart is a very useful tool in comparing a large number of materials at the concept design phase which could be reflected the fundamental relationships among particular material properties and be used to find out a range of materials suitable for a particular application. The main purpose of the present work is to selection of best candidate material for brake disc application and in order to analyse the thermal characteristics of disk brakes, thermal deformation analysis and thermal stress analysis due to heat transfer was carried out through the finite element analysis.

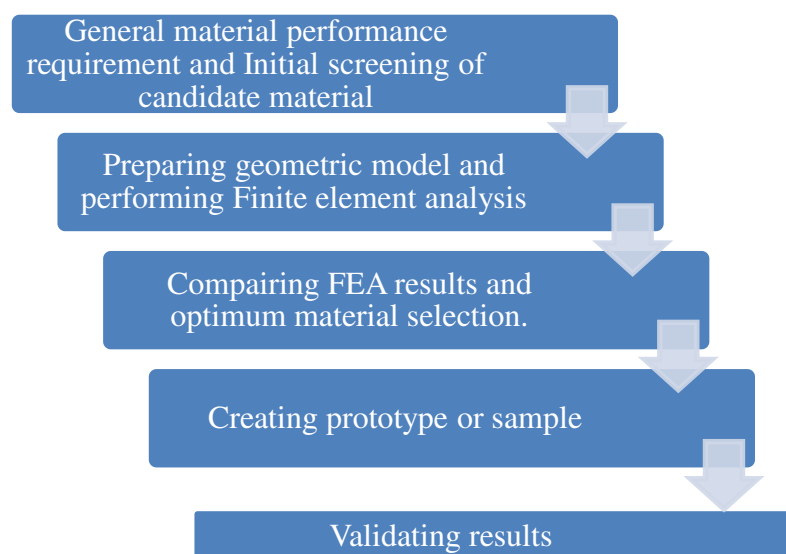


Figure 1: Flow chart of material selection method

1.4.1. General Material Performance Requirements

Disc brake systems generate braking force by clamping brake pads onto a rotor that is mounted to the hub. A schematic view of the brake system is shown in Fig. 2. The high mechanical advantage of hydraulic and mechanical disc brakes allows a small lever input force at the handlebar to be converted into a large clamp force at the wheel. This large clamp force pinches the rotor with friction material pads and generates brake power. The higher the coefficient of friction for the pad, the more brake power will be generated. Coefficient of friction can vary depending on the type of material used for the brake rotor. Typically service brakes are concerned with dynamic coefficient of friction, or the coefficient of friction measured while the vehicle is moving.

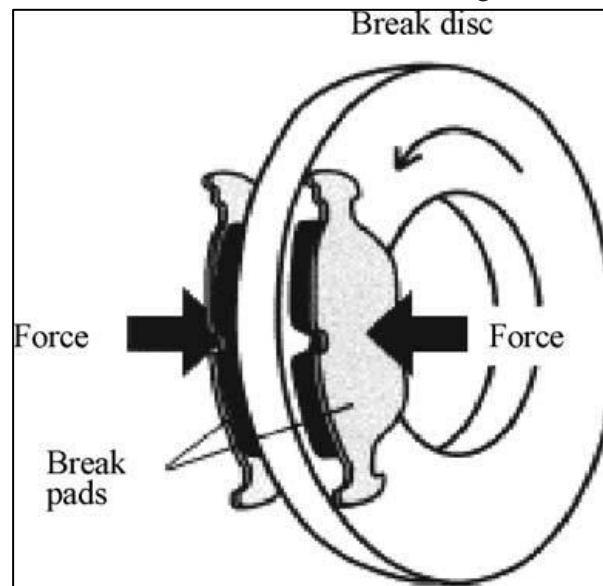


Figure 2: Schematic View of Real Size Brake System (Brake Disc and Brake Pad)

All modern disk brakes systems rely on brake pads pressing on both sides of a brake rotor to increase the rolling resistance and slow the car down. The amount of frictional force is found by multiplying the force pushing the pad into the rotor by the coefficient of friction of the pad. So, the force

slowing the brake disc or rotor is

$$F_{\text{rotor}} = 2 \cdot C_{f,\text{pad}} \cdot F_{\text{pad}} \dots\dots\dots(1)$$

The braking system is a vital safety component of ground-based transportation systems; hence the structural materials used in brakes should have possess some combination of properties such as good compressive strength, higher friction coefficient, wear resistant, light weight, good thermal capacity and economically viable.

1.4.2. Initial Screening of Candidate Material

Traditional material for automotive brake rotor is the cast iron. The specific gravity or density of cast iron is higher which consumes much fuel due to high inertia. Following section will describe the potential candidate materials those can be used for brake rotor application.

1. Cast Iron

Metallic iron containing more than 2% dissolved carbon within its matrix (as opposed to steel which contains less than 2%) but less than 4.5% is referred to as

gray cast iron because of its characteristic color. Considering its cost, relative ease of manufacture and thermal stability, this cast iron (particularly, gray cast iron), is actually a more specialized material for brake applications particularly the material of choice for almost all automotive brake discs. To work correctly, the parts must be produced at the foundry with tightly monitored chemistry and cooling cycles to control the shape, distribution and form of the precipitation of the excess carbon. This is done to minimize distortion in machining, provide good wear characteristics, dampen vibration and resist cracking in subsequent use.

2. Titanium Alloys

Titanium alloys and their composites have the potential to reduce weight of the brake rotor disc component which is about 37% less than a conventional cast iron with the same dimensions and offering good high temperature strength and better resistance to corrosion.

3. Aluminium-Metal Matrix Composite (AMC)

Aluminium alloy based metal matrix composites (MMCs) with ceramic particulate reinforcement have shown great promise for brake rotor applications. These materials having a lower density and higher thermal conductivity as compared to the conventionally used gray cast irons are expected to result in weight reduction of up to 50-60% in brake systems. The repeated braking of the AMC brake rotor lowered the friction coefficient μ and caused significant wear of the brake pad. The friction properties of the AMC brake disc are thus remarkable poorer than those of conventional brake disc. After increasing hard particles content the result showed that the repeated braking operations did not lower the friction coefficient.

4. Carbon Fibre

Strength of a material is the force per unit area at failure, divided by its density. Any material that is strong AND light has a favourable Strength/Weight ratio. Carbon Fibre reinforced plastic is over 4 times stiffer than Glass reinforced plastic, almost 20 times more than pine, 2.5 times greater than aluminium. Although carbon Fibre themselves do not deteriorate measurably, Epoxy is sensitive to sunlight and needs to be protected. Other matrices (whatever the carbon Fibre is embedded in) might also be reactive. Resistance to Fatigue in Carbon Fibre Composites is good. However, when carbon Fibre fails it usually fails catastrophically without significant exterior signs to announce its imminent failure. Carbon Fibre can have a broad range of CTE's, -1 to 8+, depending on the direction measured, the fabric weave, the precursor material, Pan based (high strength, higher CTE) or Pitch based (high modulus/stiffness, lower CTE). In a high enough mast differences in Coefficients of thermal expansion of various materials can slightly modify the rig tensions. Low Coefficient of Thermal expansion makes carbon Fibre suitable for applications where small movements can be critical. Telescope and other optical machinery is one such application.

II. LITERATURE REVIEW

Adriaan Neys [1], The brakes system is critical with respect to vehicle safety. One situation during which the brake system is put to the test is an Alpine descent. Such a descent causes very high brake system temperatures and may even induce brake fluid vaporization. In following report an In-Vehicle Brake System Temperature Model is developed and tested. This model makes use of the information that is available on the vehicle CAN-bus in order to estimate the temperature of the brake system and detect the risk of brake fluid vaporization. Implementing such a model in production vehicles would improve vehicle safety and in the long run allow downsizing of the brake system without giving in on any safety margins. Firstly, possible approaches for estimating the amount of kinetic energy that is converted into heat by the brake system are investigated.

Secondly, the Temperature Estimation Model is developed. This is composed of models of different parts of the brake system which are combined and matched to the measurements. This thesis is to develop preliminary version of a Brake System Temperature Model (BSTM) for vehicle implementation and perform the required testing to tune this model. This system should estimate the temperature of the different brake system components in order to detect dangerous situations that can arise due to over-heating of the brake system.

Abd Rahim Abu-Bakar, Huajiang Ouyang [2], This paper studies the contact pressure distribution of a solid disc brake as a result of structural modifications. Before modifications are simulated, four different models of different degrees of complexity for contact analysis are investigated. It is shown that the contact pressure distributions obtained from these four models are quite different. This suggests that one should be careful in modelling disc brakes in order to obtain correct contact pressure distributions. This work could help design engineers to obtain a more uniform pressure distribution and subsequently satisfy customers' needs by making pad life longer.

Abd Rahim Abu-Bakar, Huajiang Ouyang [3], The detailed and refined finite element model of a real disc brake considers the surface roughness of brake pads and allows the investigation into the contact pressure distribution affected by the surface roughness and wear. It also includes transient analysis of heat transfer and its influence on the contact pressure distribution. The focus is on the numerical analysis using the finite element method. The simulation results are supported with measured data in order to verify predictions. An improved numerical methodology is presented by considering three-validation stages, namely, modal analysis at component and assembly levels and verification of contact analysis. Prior to that, a realistic surface roughness of the brake pad at macroscopic level is considered in the finite element model instead of assuming a smooth and perfect surface that has been largely adopted by most previous researchers. These two aspects have brought about significant improvement to the validation as well as analysis. Wear and thermal effects are other distinct aspects of disc brakes that influence contact pressure distributions and squeal generation in a disc brake assembly and they are also

included in the current investigation. Transient analysis of disc brake vibration using a large FE model that includes thermal effects are carried out.

Ali Belhocine, Mostefa Bouchetara [4], The objective of this study is to analyse the thermal behaviour of the full and ventilated brake discs of the vehicles using computing code ANSYS. The modelling of the temperature distribution in the disc brake is used to identify all the factors, and the entering parameters concerned at the time of the braking operation such as the type of braking, the geometric design of the disc, and the used material. The numerical simulation for the coupled transient thermal field and stress field is carried out by sequentially thermal-structural coupled method based on ANSYS to evaluate the stress fields and of deformations which are established in the disc and the contact pressure on the pads. The results obtained by the simulation are satisfactory compared with those of the specialised literature. In this study, we presented a numerical simulation of the thermal behaviour of a full and ventilated disc in transient state. By means of the computer code ANSYS 11, we were able to study the thermal behaviour of three types of cast iron (AL FG 25, FG 20 and FG 15) for a determined braking mode.

In addition to the influence of the ventilation of the disc, we also studied the influence of the braking mode on the thermal behaviour of the disc's brake. The numerical simulation shows that radial ventilation plays a very significant role in cooling of the disc in the braking phase. The obtained results are very useful for the study of the thermomechanical behaviour of the disc brake (stress, deformations, efficiency and wear).

Banakar Prashanth & Shivananda H.K. [5], The objective of this research was to gain a better understanding of Mechanical properties of epoxy resin composites reinforced with carbon Fibre. The effect of Fibre orientation of laminates has been investigated & experimentation was performed to determine property data for material specifications, the laminates were obtained by hand layup process. The laminates were cut to obtain ASTM standards. This investigation deals with the testing of tensile and flexural strength on a universal testing machine. The graphs that are obtained from the tests are documented. This research indicates that the mechanical properties are mainly dependent on the Fibre orientation of laminated polymer composites.

Chavan Prashant, Apte Amol [6], Gives simplified yet almost equally accurate modeling and analysis method for thermo-mechanical analysis using brake fade test simulation as an example. This methodology is based on use of ABAQUS Axisymmetric analysis technique modified to represent effect of discrete bolting, bolt preloads, and contacts within various components of the assembly.

Cao1 Q, Friswell M I, Ouyang H, J E Mottershead1 and S James [7], this paper presents a numerical method for the calculation of the unstable frequencies of a car disc brake and the analysis procedure. The stationary components of the disc brake are modelled using finite elements and the disc as a thin plate. This approach facilitates the modelling of the disc brake squeal as a moving load problem. Some uncertain system parameters of the stationary components and the disc are tuned to fit experimental results. A linear, complex-valued, asymmetric eigenvalue formulation is derived for disc brake squeal. Predicted

unstable frequencies are compared with experimentally established squeal frequencies of a realistic car disc brake.

Faramarz Talati & Salman Jalalifar [8], In this paper, the governing heat equations for the disk and the pad are extracted in the form of transient heat equations with heat generation that is dependant to time and space. In the derivation of the heat equations, parameters such as the duration of braking, vehicle velocity, geometries and the dimensions of the brake components, materials of the disk brake rotor and the pad and contact pressure distribution have been taken into account. The problem is solved analytically using Green's function approach. It is concluded that the heat generated due to friction between the disk and the pad should be ideally dissipated to the environment to avoid decreasing the friction coefficient between the disk and the pad and to avoid the temperature rise of various brake components and brake fluid vaporization due to excessive heating.

The results obtained for contact surface temperatures of the pad and the disk show that there is a heat partition between two components in sliding contact, because of thermal resistance constituted by accumulation of wear particles at the contact surface between the pad and the disk and lack of necessary provisions for ventilation of the disk and heat dissipation to the environment through the disk. The brake rotor must serve as an efficient energy dissipation and storage device. In order to achieve this purpose, air must be circulated through the rotor to provide adequate cooling. The passages, formed by the radial fins between the braking surfaces, act as a centrifugal fan, facilitating the required air flow for cooling.

Goutham Kumar Reddy Challa, Abhinoy Krishna Guduru, Siddhartha Patlori and Dr.M.Madhavi [9], the paper describes the design and finite element analysis of carbon Fibre-epoxy resin brake rotor. The design and finite element analysis is performed by using computer aided design (CAD) software. The objective is to design and analyse the thermal and structural stress distribution of brake rotor at the real time condition during braking process. The optimization is carried out to reduce the stress concentration and weight of the brake rotor which keeps the unsprung mass low thereby increasing the stability of the vehicle. A carbon Fibre brake rotor was designed, structural and thermal analysis was performed with different thickness and a 12mm disc has very less deformation. The most important aspect is that it was found to be 50% lighter than a conventional brake disc rotor (mass properties by computational method).

Hao Xing [10], a disc brake system for passenger car is modelled and analysed using both approaches i.e. the transient analysis and complex modal analysis. Complex modal analysis is employed to extract natural frequencies and a transient analysis is carried out to study the thermal effects during braking. The effect of friction in complex modal analysis is investigated.

Jung S. P., Park T. W., Lee, J. H. W. H. Kim, and Chung W. S [11], a simple finite element model of a disc and two pads was created, and TEI phenomenon was implemented by rotating the disc with a constant rotational speed of 1400 rpm. The intermediate processor using the staggered approach was used to connect results of two other analysis domains: mechanical and thermal analysis. By exchanging calculation results such as

temperature distribution, contact power and nodal position at every time step, solutions of fully coupled thermo-mechanical system could be obtained. Contact pressure distribution of the pad surface was varied according to the rotational direction of the disc. DTV and temperature of the disc were calculated and tendency was verified by earlier studies.

Kevin A. Calzada [12], in this research, both experimental and finite element-based modeling approaches are undertaken. Fibres oriented in 0, 45, 90, and 135 degrees with respect to the direction of tool motion are investigated and unique failure theories are developed for each of these orientations. The model based on experimental observations is focused on explaining the micro-scale failure mechanisms occurring in the machining process. The finite element machining model developed in this work uses a unique modeling approach, which is capable of explaining the Fibre failure mechanisms occurring throughout the chip formation process. After development of the two machining models, the machining responses are compared to a set of machining experiments for validation purposes. Fibres orientated in the 45 and 90 degree orientations were found to fail in compressive crushing-dominated failure while Fibres oriented in the 135-degree orientation were found to fail in bending below the surface of the cut. In the 0-degree orientation, the Fibres were proposed to fail in buckling or bending-dominated failure, depending on the depth of cut, and tool geometry of the process. The micro-scale Fibre failure mechanisms were observed to differ significantly from their macro-scale counterparts. The machining responses of the two models were found to agree well with the experimental validation analyses indicating that these models are an accurate representation of the chip formation process.

Khalid Mahmood Ghauri, Liaqat Ali [13], Ceramics contain a distinctive property of completely absence of slip planes and have least probability of deforming by the application of force. Among these ceramics, the silicon carbide occupies a competent place to be used as a reinforcing agent for aluminum or its alloys. It has the density close to aluminum and is best for making composite having good strength and good heat conductivity. Stir casting has been used to synthesize Al/SiC MMCs by reinforcing silicon carbide particles into aluminum matrix. The reason for using stir casting is to develop technology for the development of MMCs at affordable cost. The selection of SiC as reinforcement and Al as matrix is because of their easy availability. The practical data acquired, analyzed and optimized will be interpreted in the light of information available in the literature and be shared with the relevant industries. The present work was mainly carried out to characterize the SiC/Al composite which was produced by reinforcing the various proportions of SiC (5, 10, 15, 25 and 30%) in aluminum matrix using stir casting technique. Mechanical properties of test specimens made from stir-casted Aluminum-Silicon Carbide composites have been studied using metallographic and mechanical testing techniques. It was observed that as the volume fraction of SiC in the composite is gradually increased, the hardness and toughness increase. However, beyond a level of 25-30 percent SiC, the results are not very consistent, and depend largely on the uniformity of distribution of SiC in the aluminum matrix.

Kumar Santhosh M, Dr. S. G. Gopala Krishna & Dr. Rajanna. S [14], this project presents the study of tensile, flexural & moisture absorption properties of composites made

from Sglass, Carbon and E-glass Fibre. The specimens are prepared using hand lay-up techniques as per ASTM standard for different thickness 2mm and 3mm and Fibre orientation of 30°, 45° and 60°, where an attempt is made to study the properties of composite materials by composing the different materials together to obtain the desired properties by increasing the thickness and Fibre orientation. By the variation of thickness tensile strength of hybrid composite is observed for each thickness and is compared with the finite element analysis results. The test ready specimens were subjected to tensile and flexural loads on UTM. This research indicates that tensile strength is mainly dependent on the Fibre orientation & thickness of laminated polymer composites. The moisture absorption increases with the Fibre, filler content and duration of immersion in water.

Maruthi B. H., H.L. Guruprasad and Yogesh Kumar [15], Transient Thermal and Structural Analysis of the Rotor Disc of Disk Brake is aimed at evaluating the performance of disc brake rotor of a car under severe braking conditions and there by assist in disc rotor design and analysis. In the present work, an attempt has been made to investigate the suitable hybrid composite material which is lighter than cast iron and has good Young's modulus, Yield strength and density properties. Aluminium base metal matrix composite and High Strength Glass Fibre composites have a promising friction and wear behaviour as a Disk brake rotor. The transient thermo elastic analysis of Disc brakes in repeated brake applications has been performed and the results were compared. The suitable material for the braking operation is S2 glass Fibre and all the values obtained from the analysis are less than their allowable values. Hence the brake Disc design is safe based on the strength and rigidity criteria

Mazidi H, Jalalifar S., Chakhoo J. [16], In this study, the heat conduction problems of the disc brake components (Pad and Rotor) are modelled mathematically and is solved numerically using finite difference method. In the discretization of time dependent equations, the implicit method is taken into account. In the derivation of heat equations, parameters such as the duration of braking, vehicle velocity, Geometries and the dimensions of the brake components, Materials of the disc brake rotor and the PAD and contact pressure distribution have been taken into account.

Nouby M., D. Mathivanan, K. Srinivasan [17], proposes an approach to investigate the influencing factors of the brake pad on the disc brake squeal by integrating finite element simulations with statistical regression techniques. Complex eigenvalue analysis (CEA) has been widely used to predict unstable frequencies in brake systems models. The finite element model is correlated with experimental modal test. The 'input-output' relationship between the brake squeal and the brake pad geometry is constructed for possible prediction of the squeal using various geometrical configurations of the disc brake. Influences of the various factors namely; Young's modulus of back plate, back plate thickness, chamfer, distance between two slots, slot width and angle of slot are investigated using design of experiments (DOE) technique. A mathematical prediction model has been developed based on the most influencing factors and the validation simulation experiments proved its adequacy.

Ouyang Huajiang, Nack Wayne, Yongbin Yuan, Frank Chen [18], Covers two major approaches used in the automotive industry, the complex eigenvalue analysis and the transient analysis. The advantages and limitations of each approach are examined. This review can help analysts to choose right methods and make decisions on new areas of method development. It points out some outstanding issues in modelling and analysis of disc brake squeal and proposes new research topics. It is found that the complex eigenvalue analysis is still the approach favoured by the automotive industry and the transient analysis is gaining increasing popularity.

P. Liu a, H. Zheng a, C. Cai a, Y.Y. Wang a, C. Lua, K.H. Ang b, G.R. Liu [19], An attempt is made to investigate the effects of system parameters, such as the hydraulic pressure, the rotational velocity of the disc, the friction coefficient of the contact interactions between the pads and the disc, the stiffness of the disc, and the stiffness of the back plates of the pads, on the disc squeal. The simulation results show that significant pad bending vibration may be responsible for the disc brake squeal. The squeal can be reduced by decreasing the friction coefficient, increasing the stiffness of the disc, using damping material on the back plates of the pads, and modifying the shape of the brake pads.

Patil Deogonda & Vijaykumar N Chalwa [20], the development and mechanical characterization of new polymer composites consisting of glass fibre reinforcement, epoxy resin and filler materials such as TiO₂ and ZnS. The newly developed composites are characterized for their mechanical properties. Experiments like tensile test, three point bending and impact test were conducted to find the significant influence of filler material on mechanical characteristics of GFRP composites. The tests result have shown that higher the filler material volume percentage greater the strength for both TiO₂ and ZnS filled glass epoxy composites, ZnS filled composite show more sustaining values than TiO₂.

Piotr GRZEŚ [21], The aim of this paper was to investigate the temperature fields of the solid disc brake during short, emergency braking. In this paper transient thermal analysis of disc brakes in single brake application was performed. To obtain the numerical simulation parabolic heat conduction equation for two-dimensional model was used. The results show that both evolution of rotating speed of disc and contact pressure with specific material properties intensely effect disc brake temperature fields in the domain of time.

Prashanth Banakar & H.K. Shivananda [22], the objective of this research was to gain a better understanding of Mechanical properties of epoxy resin composites reinforced with carbon Fibre. The effect of Fibre orientation of laminates has been investigated & experimentation was performed to determine property data for material specifications, the laminates were obtained by hand layup process. The laminates were cut to obtain ASTM standards. This investigation deals with the testing of tensile and flexural strength on a universal testing machine. The graphs that are obtained from the tests are documented. This research indicates that the mechanical properties are mainly dependent on the Fibre orientation of laminated polymer composites.

Pohane Rajendra, R. G. Choudhari [23], FEM model is prepared for contact analysis. A three dimensional finite element model of the brake pad and the disc is developed to

calculate static structural analysis, and transient state analysis. The comparison is made between the solid and ventilated disc keeping the same material properties and constraints and using general purpose finite element analysis. This paper discusses how general purpose finite element analysis software can be used to analyze the equivalent (von-mises) stresses & the thermal stresses at disc to pad interface.

III. DESIGNING THE BRAKE DISC

The first step is development of CAD model according to geometric specifications followed by selection of material. Finite element analysis is done using simulation software for different materials. Deformation, Von Mises stress and Maximum temperature generated are investigated by coupled thermomechanical.

3.1. Geometrical Modelling

The model is constructed by using CATIA V5R21, the explode view of the model as shown in Figure 3.

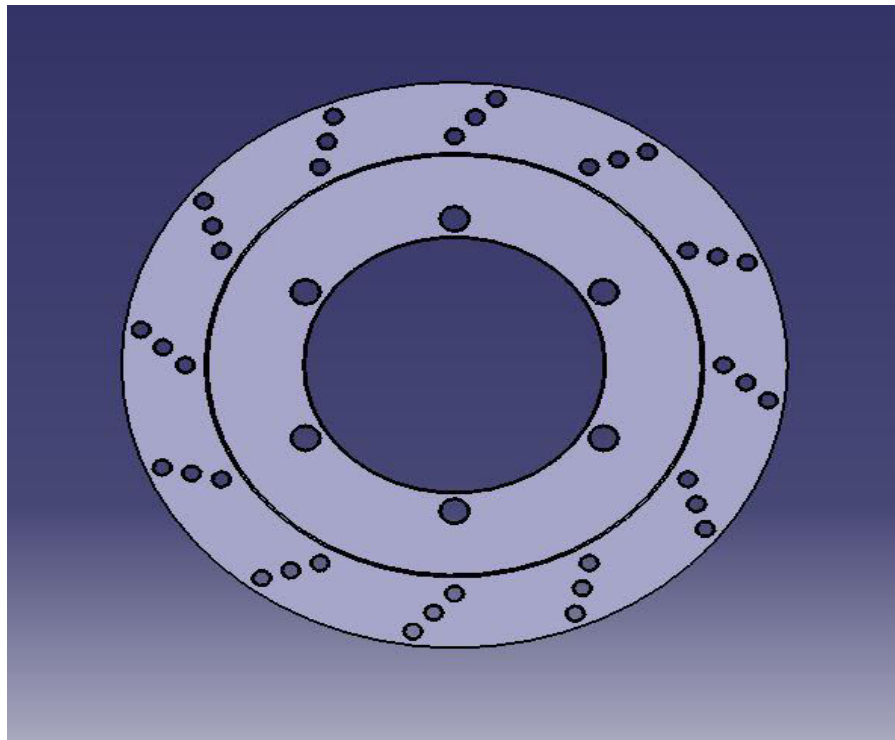


Figure 3: CAD Model of Brake Disc.

3.2. Design Calculations of Brake Rotor

The dimensions of Honda Unicorn brake rotor were considered for the design purpose

- Disc diameter = 240 mm
- Pad rotor contact = 60 mm (radius)
- P = fluid pressure, Pa
- FP = pedal force = 25 Kg = 245 N
- R = pedal lever ratio = 4: 1
- H = Pedal efficiency = 0.8

- Standard size of master cylinder is 12.055mm.

i. **Actual Pressure Generated by The System:**

$$P = (FP \times R \times \eta) / A$$

$$P = (245 \times 4 \times 0.8 \times 4) / (\pi \times 12.0552 \times 10^{-6})$$

$$P = 6.87 \text{ MPa.}$$

ii. **Clamping Force Is Calculated as:**

The clamping load is assumed to act on all friction surfaces equally. For dry disc brakes it doesn't matter whether the brake is of the sliding type or opposed piston. Newton's Third Law state every force has an equal and opposite reaction and a reaction force from a sliding caliper is the same as an opposed piston one.

$$CM = PM \times AT$$

Where, CF = Clamping Force (N)

PM = Maximum hydraulic pressure (Pa)

AT = Total effective area of calliper pistons (m^2) – for fixed callipers this is the actual area of the pistons, for floating callipers this is equal to 2 x the actual area of the pistons.

$$CF = (6.87 \times 106 \times 2\pi \times 0.025912) / 4$$

$$CF = 7240.88 \text{ N}$$

iii. **Brake Torque Developed Is Calculated as:**

Having decided which wheels will need braking to generate sufficient braking force the torque requirements of each wheel need to be determined. For some legislation the distribution between front and rear brakes is laid down. This may be achieved by varying the brake size or more likely using a valve to reduce the actuation pressure.

$$T_{Bd} = CF \times \mu_L \times R_e$$

Where, T_{Bd} = Brake Torque Developed (N-m)

CF = Clamping Force (N)

μ = Coefficient of friction between brake pads and rotors (= 0.3)

R_e = Effective rotor radius (m) – measured from the centre of the rotor to the centre of the brake pad.

$$T_{Bd} = CF \times \mu \times R_e$$

$$T_{Bd} = 7240.88 \times 0.3 \times 0.105$$

$$T_{Bd} = 228 \text{ Nm}$$

During a dynamic application of a brake the energy of the machine will be converted to heat, generated between the pad and the disc. It is the temperature of the disc surface that is normally used to assess the brake performance. Failure to take account of the peak temperature can lead to a reduced braking performance due to the onset of brake fade.

In order to provide a consistent controlled performance of a brake it is also important to check the power dissipated during a stop. This affects the condition of the brake pads. To calculate the power dissipation, it is necessary to calculate the total energy absorbed during the stop, estimated as follows:

iv. Kinetic Energy:

Assuming the stop is from the test speed down to zero then the kinetic energy is given by: -

$$K.E. = \frac{1}{2} \times M \times v^2 \text{ (joule)}$$

Where, K.E = Kinetic Energy (joule),

M = Total weight of vehicle (kg),

v = Velocity of vehicle (m/s)

$$K.E. = \frac{1}{2} \times 220 \times 27.778^2$$

$$K.E. = 84876.543 \text{ Joule}$$

v. Braking Power:

Only when the brake is applied (but rotating) is energy being dissipated in the brake system. Some of the stop energy is dissipated in the tyre as wheel slip. Managing the ideal wheel slip is the ultimate goal of ABS development but here assume 8%. The energy to each brake depend on the number of brakes and the proportion of braking on each axle.

In order to calculate the power, we need to know the brake on time:

$$\text{Time } t = \frac{v}{a \times g} \text{ (sec)}$$

Where, t = Stopping Time of vehicle (sec)

a = Deceleration (m/s²)

g = acceleration due to gravity

$$t = \frac{27.778}{0.45 \times 9.81}$$

$$t = 6.29 \text{ sec} \approx 6 \text{ sec}$$

The power is then given by:

$$\text{Power } P = \frac{E}{t} \text{ (Watt)}$$

Where, P = Average power (watt)

E = Total energy (Joule)

t = Stopping time (sec)

$$P = \frac{84876.543}{6.5}$$

$$P = 13057.93 \text{ Watt}$$

This is the average power, the peak power at the onset of braking is double this.

vi. Heat Flux into One Side of the Disc:

$$\text{Heat flux, } q = \frac{4 \times P}{\pi \times (D_o^2 - D_i^2)}$$

Where, q = Heat Flux (Watt/m²)

P = Average Power (Watt)

D_o = Disc useable outside diameter (mm)

D_i = Disc useable inside diameter (mm)

$$q = \frac{4 \times 13057.93}{\pi \times (0.240^2 - 0.180^2)} = 659756.859 \text{ watt/m}^2$$

3.3. Material Properties

Table 1: Material Properties

Properties	Stainless Steel	Aluminium Silicon Carbide MMC	Carbon Fibre	E-glass Fibre
Modulus of Elasticity(GPa)	195	192	70	72.3
Poisson's Ratio	0.25	0.25	0.1	0.22
Density (kg/m ³)	7900	3000	1600	2580
Coefficient of Thermal expansion(1/K)	7.5e-5	7.5e-6	2e-6	5.4e-6
Thermal conductivity(W/mK)	16.1	160	28	1.3
Specific Heat(J/gK)	510	0.74	400	810

3.4. Finite Element (Fe) Model

The first step was to prepare a structure model of the brake disc with pads. This was carried out using finite element software (Fig. 5). Then it was meshed and defined by boundary conditions to put on ANSYS Multiphysics and to initialize the calculation. A commercial FE software, namely ANSYS 16 (3D) is fully utilized to simulate structural deformation, stress, temperature and contact pressure distributions of the disc brake during braking application.

3.4.1. Meshing of The Disc

The elements used for the meshing of the disc are quadahedral three-dimensional elements with 10 nodes (isoperimetric). In this work, a three-dimensional FE model consists of a disc as illustrated in Figure 4. Whilst; Figure 5 shows contact zone between the disc and pad, details of the mesh properties are given in Table 1. A frictional contact pair was defined between disc-pad interfaces. In this simulation, the meshing was refined in the contact zone (disc-pad). This is important because in this zone, the temperature varies significantly. Indeed, in this strongly deformed zone, the thermomechanical gradients are very high. That is why the correct taking into account of the contact conditions involves the use of a refined mesh. Multiphysics and to initialize the calculation.

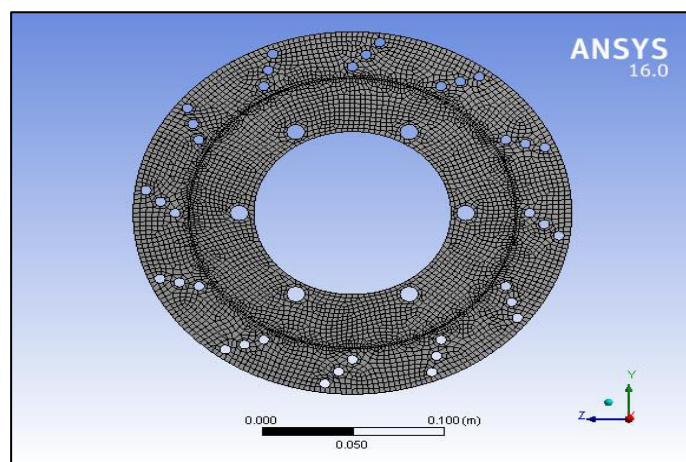


Figure 4: Meshing of Brake Disc

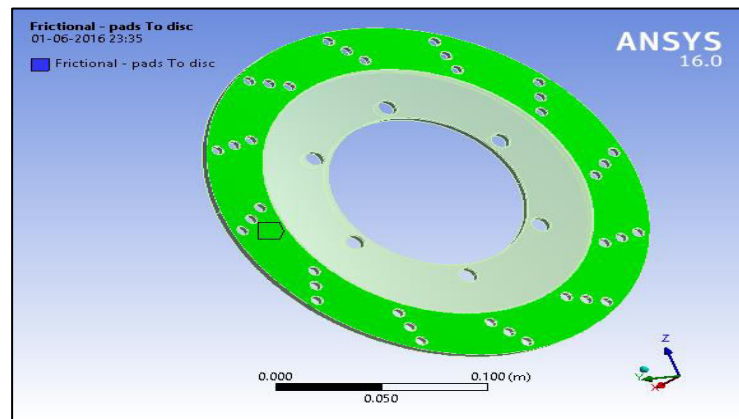


Figure 5: Contact Zone of the Disc and Pad

3.4.2. Loading and Boundary Conditions Transient Thermal Analysis

The principle of braking is kinetic energy with which the vehicle is propelling is converted to heat energy when brakes are applied. Therefore, the disc should possess high heat transfer rate to dissipate the heat produced when brake is applied. The mode of heat transfer at brakes is combination of convection and radiation. Heat produced when brake applied is dissipated into surroundings through convection between pad-rotor and air around it. Heat generated on the disc is cooled to ambient temperature through radiation. The thermal loading is characterised by the heat flux entering the disc through the real contact area (two sides of the disc). The initial and boundary conditions are introduced into module ANSYS Workbench. The thermal calculation will be carried out by choosing the transient state and by introducing physical properties of the materials. The selected data for the numerical application is summarised as follows:

- Total time of simulation = 8 (s).
- Increment of initial time = 0.25 (s).
- Increment of minimal initial time = 0.125 (s).
- Increment of maximal initial time = 0.5 (s).
- Initial Temperature of the disc = 60 (°C).
- Materials: Stainless Steel, Aluminium Silicon Carbide MMC, Carbon Fibre and E-glass Fibre.

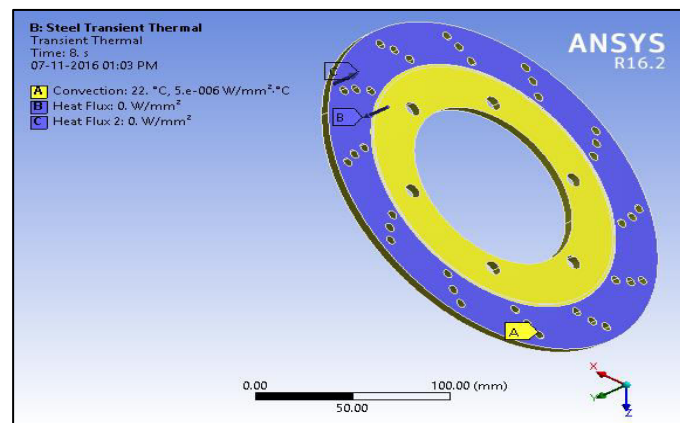


Figure 6: Boundary Conditions Transient Thermal Analysis

3.4.3. Results and Discussions for Transient Thermos-Elastic Analysis

Thermal and structural analysis is performed in order to know the displacement, rotor stress component, maximum temperature generated, Thermal strain and Thermal stress developed on a rotor disc brake for different materials as shown in figures below. For different materials for Rotor disc brake the same procedure has been followed and the results are tabulated.

A. Results of Coupled thermomechanical analysis of Stainless steel 321 brake disc

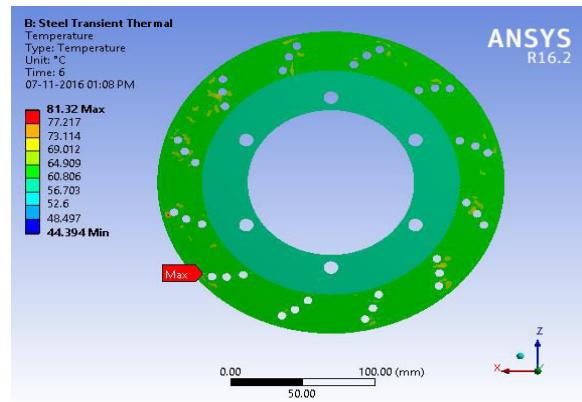


Figure 7: Maximum Temperature Generated in Stainless Steel 321 Brake Disc

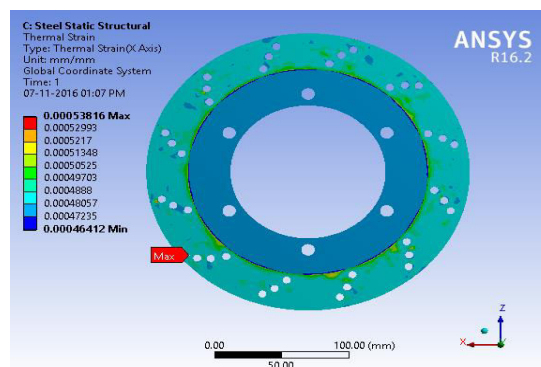


Figure 8: Thermal Strain in Stainless Steel 321 Brake Disc

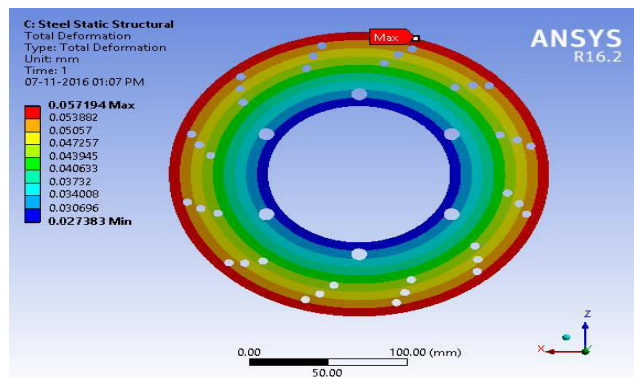


Figure 9: Maximum Deformation in Stainless Steel 321 Brake Disc

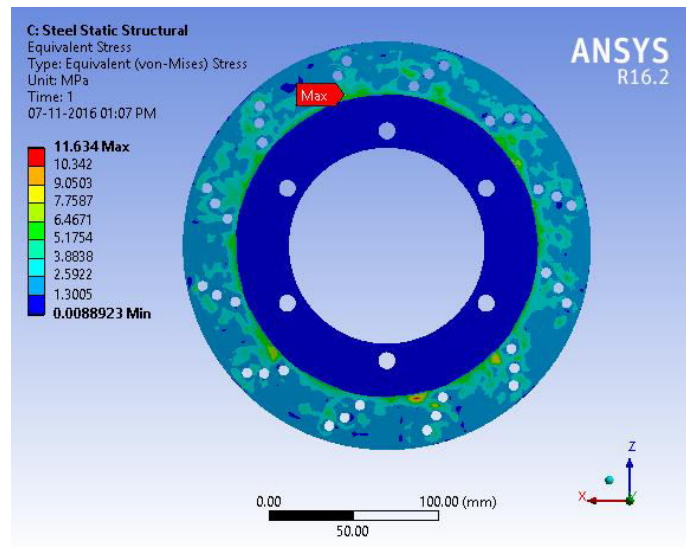


Figure10: Maximum Stress Developed in Stainless Steel 321 Brake Disc

B. Results of Coupled thermo mechanical analysis of Aluminium silicon carbide MMC brake disc

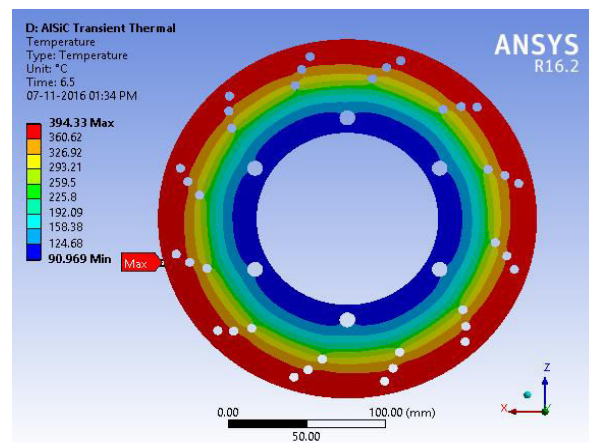


Figure 11: Maximum Temperature Generated in Aluminium Silicon Carbide MMC Brake Disc

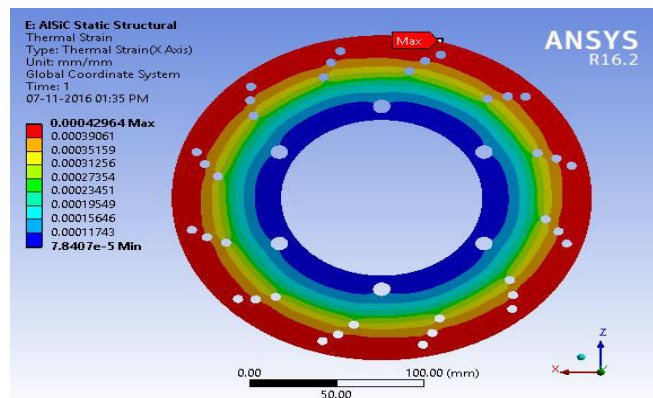


Figure12: Thermal Strain in Aluminium Silicon Carbide MMC Brake Disc

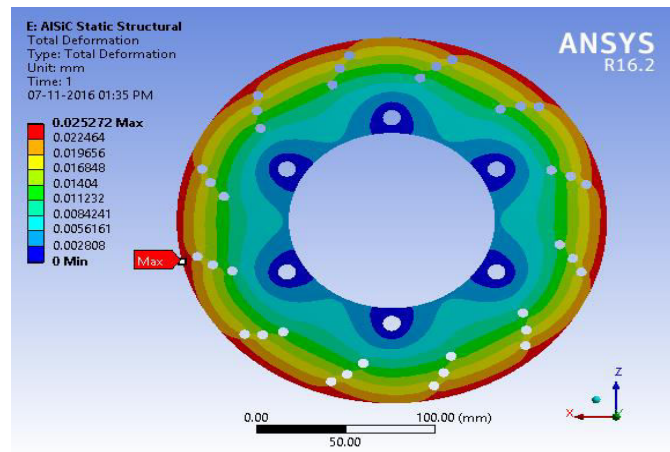


Figure 13: Maximum Deformation in Aluminium Silicon Carbide MMC Brake Disc

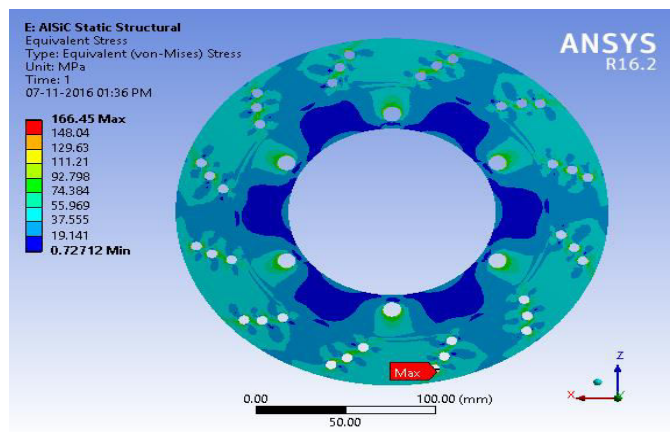


Figure 14: Maximum Stress Developed in Aluminium Silicon Carbide MMC Brake Disc

C. Results of Coupled thermomechanical analysis of Carbon Fibre brake disc

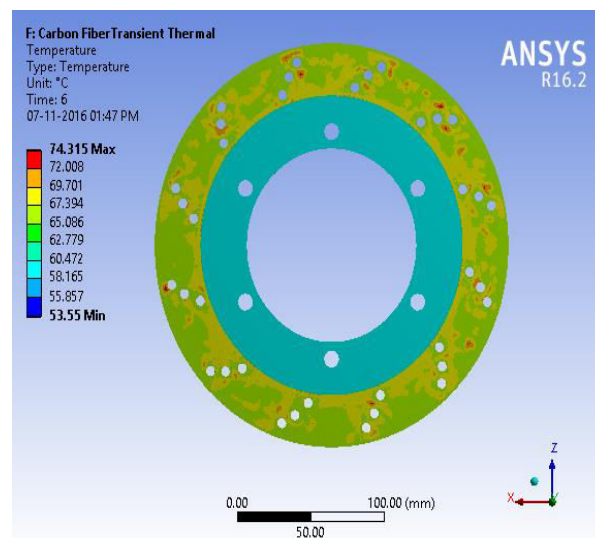


Figure 15: Maximum Temperature Generated in Carbon Fibre Brake Disc

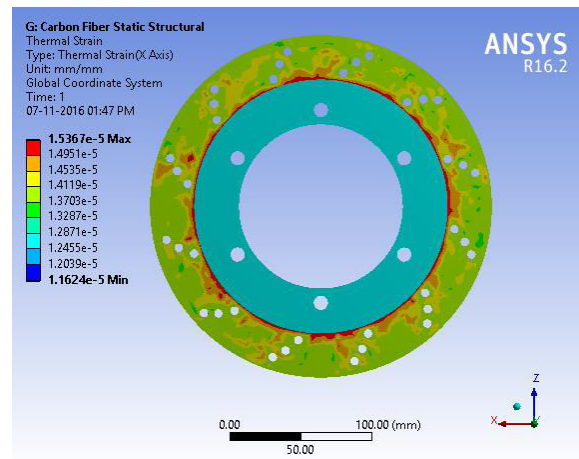


Figure 16: Thermal Strain in Carbon Fibre Brake Disc

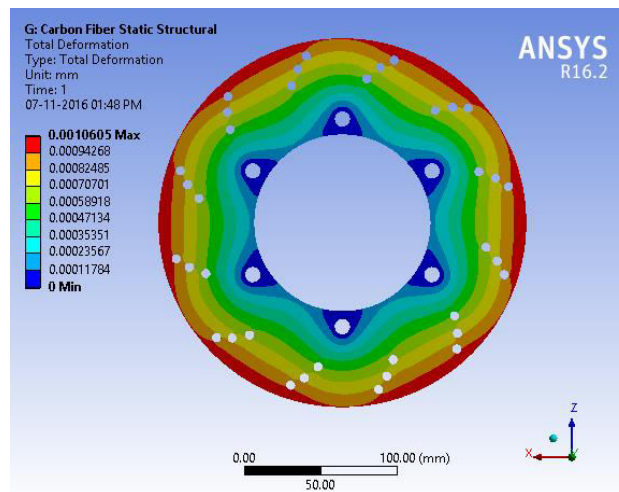


Figure 17: Maximum Deformation in Carbon Fibre Brake Disc

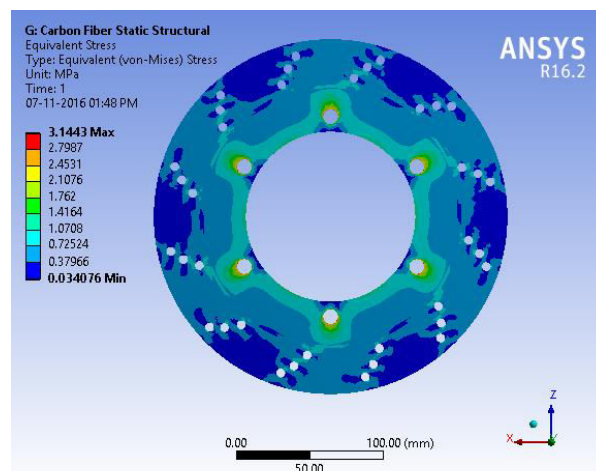


Figure 18: Maximum Stress Developed in Carbon Fibre Brake Disc

Table 2: Transient Thermos-Elastic Analysis Result Table

Sr. No.	Material	Maximum temperature generated (°C)	Maximum thermal strain	Maximum Deformation (mm)	Maximum Stress (MPa)	Weight (Kg)
1.	Stainless steel 321	81.32	5.72E-02	5.38E-04	11.634	1.3008
2.	AlSiC MMC	394.33	4.30E-04	2.53E-02	166.45	0.49713
3.	Carbon Fibre	74.315	1.54E-05	1.06E-03	3.1443	0.26513

Table No 2 shows the result of Transient Thermos-Elastic Analysis. From above analysis result, Maximum temperature is generated in AlSiC which is 74.315 °C and minimum temperature is generated in Carbon Fiber which is 123.67°C but the thermal strain and stress in carbon Fibre is less than that the stainless steel. The weight of carbon Fibre disc is 265.13 grams which is 75% less than that the stainless steel brake disc.

Figure no. 24 represents the Stress, strain and weight of material in graphical form and gives better idea about the different material brake disc. Time vs temperature graph is shown in figure no. 25 which shows the temperature of brake disc of all candidates' materials at various time of braking.

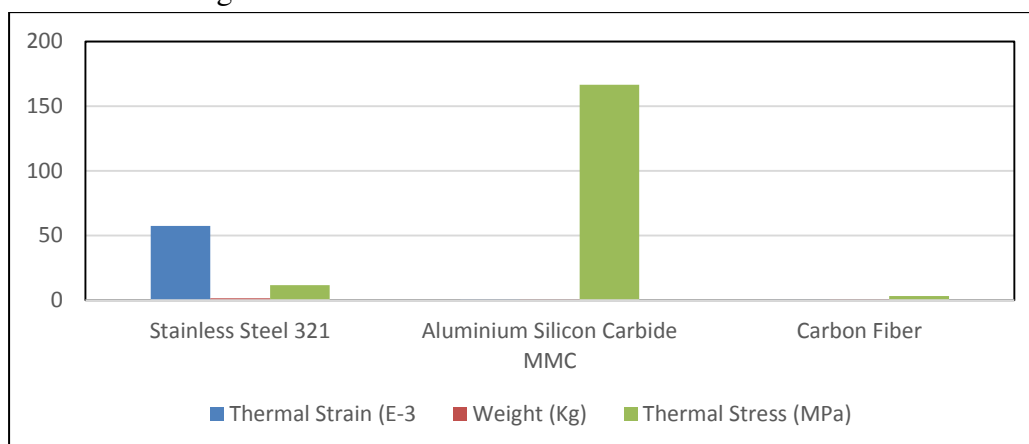


Figure 19: Stress, Strain and Weight Comparison Chart Transient Thermos-Elastic Analysis

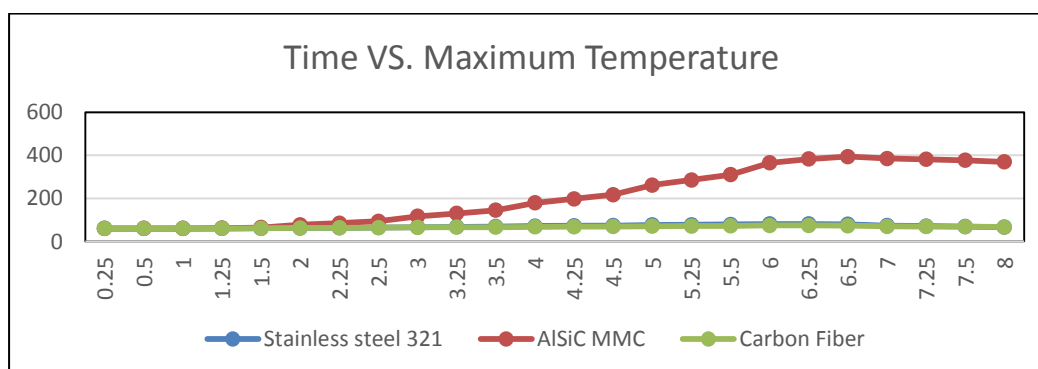


Figure 20: Time VS Temperature Chart of Transient Thermos-Elastic Analysis

IV. SAMPLE PREPARATION

a. Aluminium Silicon Carbide Sample Perpetration

The composition of the commercial purity aluminium used for casting Al-matrix composite is as shown in Table 1. The reduction in particle size of SiC from micron level to the nano level was carried out using a ball mill in a stainless steel chamber using tungsten carbide and zirconia balls. The estimated particle sizes of SiC were found to be ranged from 10 to 15 μm . Silicon carbide (SiC) has been used as reinforcement. It has a theoretical density of 3.1 g/cm^3 . The SiC contents in the composites were adjusted to be either 60 to 63 wt%. SiC was originally produced by ball milling.

Table 3: Chemical composition of commercial purity aluminium (wt%).

Al%	Ti%	Zn%	Ni%	Mg%	Mn%	Mn%	Fe%	Si%	Cu%
99.8377	0.0003	0.0019	0.0018	0.0012	0.0021	0.0021	0.09	0.06	0.005

The experimental set up for a stir casting process is shown in Figure 1. The aluminum was melted into a graphite crucible inside a Bituminous Coal Furnace at 750°C. No wetting agent to bind molten metal and reinforcement powder was used. The furnace temperature was kept, above melting point of aluminum, at 750°C, for 10 minutes. Aluminum dross is then removed from the surface of the molten metal. Steel Stir impeller was then lowered down into the molten metal and allowed to rotate at 100 rpm for 10 minutes. When the vortex appears, the hot powder of SiC, preheated to 1000°C, was uniformly added to the molten matrix. The angular velocity of stirrer during adding process is then raised to 150 rpm. The powder is added at a rate of 6 g/min. The crucible containing the melt mixture was then carefully taken out of furnace and poured into a specially designed permanent mold. The mold was left to cool and castings were ejected.



Figure 21: Casting Furnace.

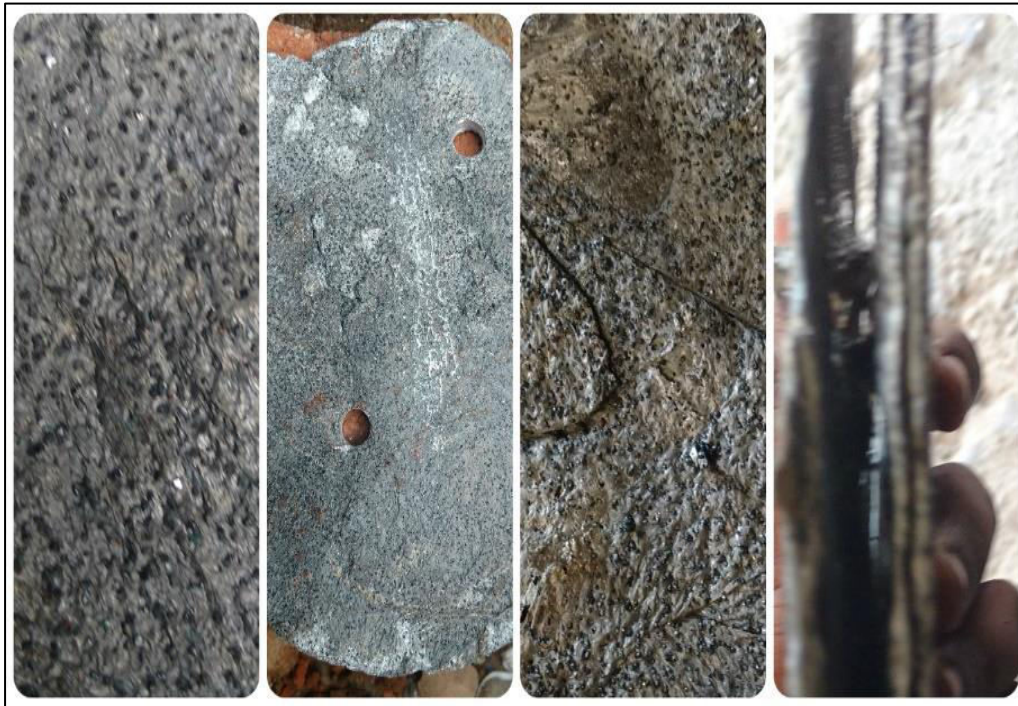


Figure 22: Sample specimens of AlSiC Composite

b. Carbon Fibre Sample Preparation

Material used for sample preparation is as follows:

- Type of resin: Polyester
- No of Laminates: 8
- Type of Fibre: Uni-Directional (UD)
- Hardener: ARADHUR HY 951

Nature of Laminate: Symmetric type (Ex. 0,90,0,90) s

Method of manufacturing: Hand Layup technique.

Composite Fibre material consisting of extremely thin Fibres about 0.025 mm in thickness. The Uni-directional Fibres are available in the standard form 395 GSM. Uni-Directional Fibres are cut to the required size & shape. These are stacked layer by layer of about 8 layers to attain the thickness of 4 mm as per the Standard Specimen. Bonding agent (Polyester) is applied to create bonding between 8 layers of sheet. Polyester is a copolymer; that is, it is formed from two different chemicals. These are referred to as the "resin" and the hardener". The resin consists of monomers or short chain polymers. The process of polymerization is called "curing", and can be controlled through temperature and choice of resin and hardener compounds. In this work the composite laminate is prepared using compression molding technique. The laminates were cured in room temperature and constant pressure for two days. Here 8 plies of Carbon Fibre are taken in a symmetric manner i.e. (0,90,0,90) s one over the other and Polyester resin is used as an adhesive. The size of the mould taken as $250 \times 250 \times 4 \text{ mm}$. The laminated test specimens were prepared by a wire cutting machine and edges were grinded.



Figure 23: Carbon Fibre Sample Preparation

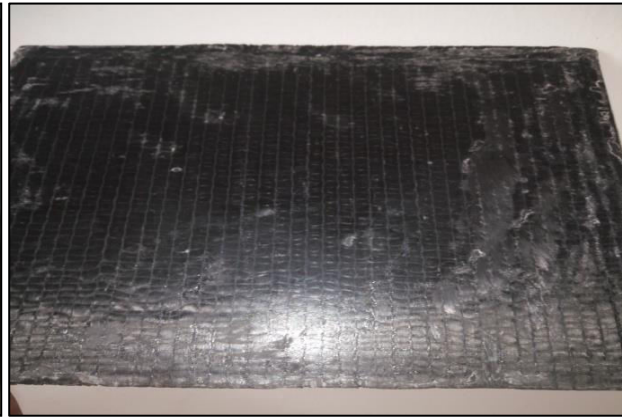


Figure 24: Carbon Fibre Sample Plate

V. TESTING OF SAMPLES

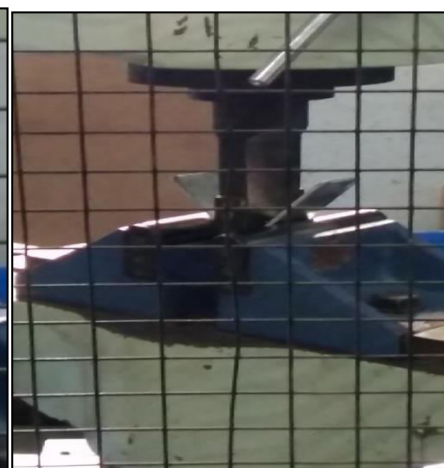
a. Carbon Fibre Disc Testing



(a)



(b)



(c)

Figure 25: Testing of carbon Fibre on UTM, (a) Clamping of sample, (b) Deformation after applying load, (c) Deformation at maximum load

The composite laminates were subjected to various loads and computer controlled UTM. The specimens were clamped and tests were performed. The tests were closely monitored and conducted at room temperature. The load at which the complete fracture of the specimen occurred has been accepted as breakage load.

Carbon Fibre sample can have sustained up to 4000N load after which it starts braking which is much higher than that the aluminium sample which can have sustained load up to 2000 N.



Figure 27: Actual Assembly of Carbon Fibre Brake Disc on Vehicle

Carbon Fibre brake disc was mounted on Honda Unicorn Bike for testing purpose. Figure No. 31 and Figure No. 32 Shows the actual mounting and assembly of carbon Fibre brake disc on bike

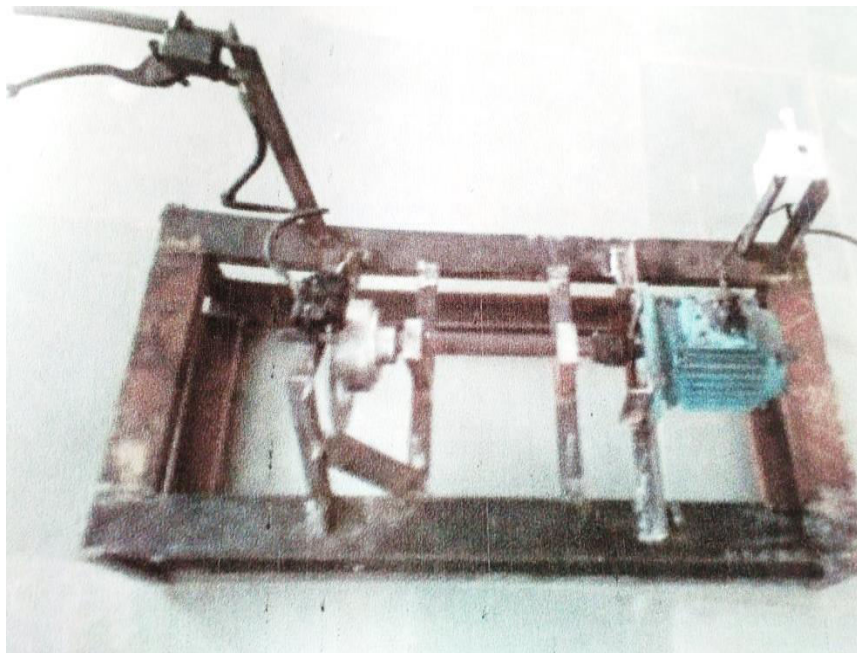


Figure 28: Testing Set up

Table 4: Testing Results

Sr. No.	Testing Parameters	Stainless steel 321	Al Si C MMC	Carbon Fibre	Testing Instrument
01	Maximum temperature generated (°C)	79.94	348.42	76.81	Infrared Sensor
02	Maximum thermal strain	6.82E-02	3.560E-04	1.84E-05	Strain Meter
03	Maximum Deformation (mm)	4.38E-04	3.53E-02	1.08E-03	Computerized UTM
04	Maximum Stress (MPa)	18.56	188.85	2.823	Computerized UTM
05	Weight (Kg) before wear	1.310	0.5213	0.2424	Digital Weighting
06	Weight (Kg) after wear (3 Days)	1.308	0.5108	0.2406	Digital Weighting

VI. CONCLUSIONS

This project gives a numerical simulation of the thermal behaviour of brake disc for four different materials in transient state. By means of the computer software ANSYS 16. In order to improve the braking efficiency and provide greater stability to vehicle, an investigation was carried out and the suitable hybrid composite material which is lighter than traditional materials used for brake disc and has preferably good Young's modulus, Yield strength and density properties. Though the disc has low weight, it has hardness, greater stable characteristics which can withstand high pressure, temperature and resistance to thermal shock.

The results obtained from above study leads to the following conclusions:

- Traditional material has many problems such as scarring, cracking, warping or excessive rusting.
- SiC/Al composites can be made in an open atmosphere by stir casting using fabrication scheme derived from the literature review and mentioned in the experimental.
- AlSiC had good thermal properties as well as lighter in weight than traditional materials but it is difficult to cast it with regular casting technique which make the manufacturing of AlSiC complex and costly than other materials.
- Glass Fibre had good thermal properties showing thermal strain as 0.0018205, but cannot withstand to dynamic load coming on brake disc. Due which it fails in compressive loading.
- Carbon Fibre having lowest thermal strain than any material i.e 0.0010157 as well as it can withstand the dynamic load coming on brake disc. it is approximately 70% lighter than traditional brake disc
- In carbon Fibre brake disc, the temperature change due to application of brake is also less and therefore heat dissipation takes place at faster rate and wear of the disc is also very less.

From above discussion we can conclude that the carbon Fibre is the optimum material for the brake disc as it can withstand to both dynamic load as well as thermal load coming on brake disc also it lighter in weight.

Future Scope of the Project

In our function, the best a mix of both composite material that's brighter compared to toss in terms of iron and possesses good Young's modulus, provide energy along with density properties is usually been recently looked into. A transient thermal research will likely be carried out to analyse the actual heat alternative over the utilizing asymmetric aspects. Additionally, structural research also is carried out by simply coupling thermal research. A transient thermal research will likely be carried out to produce light weight, cost effective and eco-friendly material having combine properties of Fibre and ceramic.

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High-Throughput and Area-Efficient FPGA Implementations of Data Encryption Standard

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1 st	Jayampu Manohar	Associate Professor, Department of Elect. & Comm. Engineering, Jagan's College of Engineering & Technology, Chavatapalem , Nellore, Andhra Pradesh
2 nd	P. Hari Krishna	Professor, Department of Elect. & Comm. Engineering Sri Venkatesaperumal college of Engineering & Technology, Puttur-Chittor, Andhra Pradesh
3 rd	Dr. K.V. Ramanaih	Professor Yogivemana University , Proddutur, Kadapa Andhra Pradesh

Abstract

One of the most popular standards for protecting confidential information is the Data Encryption Standard (DES). Although it has been replaced by the Advanced Encryption Standard (AES), it is still widely used in Automatic Teller Machines (ATM's), smartcards, and mobile phone SIM cards. In this paper, we present area-efficient and high-throughput FPGA implementations of the DES which are developed using the Xilinx FPGA ISE design suite. In fact, we propose modifications on the fastest DES design reported in the literature and achieve 1.1 times higher speed. Also, we introduce an 8-stage pipelined design that needs only 0.75 times the registers and consumes 0.65 times the power of a similar 16-stages pipelined design. High-speed design and synthesis optimization techniques including pipelining, register retiming, and logic replication are used. Postlayout synthesis results show that the proposed implementations achieve high throughput-to-area ratio. To make a fair comparison, the proposed designs were synthesized using matching FPGA devices as being used by other implementations reported in the literature.

I. INTRODUCTION

Requirement of various high data transfer rates and high channel capacities by different operating modes of the present day cell phones motivated the telecommunication industry to spawn the concept of software defined radio (SDR). According to [1] and [2], SDR refers to a single device that is capable of supporting all the present as well as emerging standards available under the wireless communication category. In an SDR system, multiple standards can be realized in a single chip by providing a programmable channel select filter at the baseband level. Different standards have different channel bandwidths, sampling rates, carrier-to-noise ratios, blocking, and interference profiles. This makes the development of a reconfigurable sample rate converter chip to be a major challenge faced by the telecommunication industry of today.

Efficient use of lookup tables (LUTs) in this design helps to reduce the power and area while compared with the conventional FIR filter implementation. In case of higher order filter implementation; this architecture fails to achieve low power because of an increase in the ROM size. Meher et al. presented an area-delay-power efficient FIR filter by systolic decomposition of distributed arithmetic (DA)-based inner-product computation. The implementation results listed in this brief show that reduction in memory size leads to increase in the latency and area. Based on modified DA technique, high-speed and medium-speed FIR filter architectures have been proposed in [3]. The high-speed FIR filter architecture where the LUTs are working in parallel draws a very high current and involves huge area consumption.

II. LITERATURE SURVEY

Ankita Mandal had surveyed the reconfigurable FIR filter architectures by analyzing various methods for low power consumption. While using the Common Sub-expression Elimination (CSE) method, it limits the filter coefficients and adder operation was reduced. So that the overall area consumption was increased and the number of registers also increased. Then Canonic Signed digit (CSD) was analyzed and it is not suitable for reconfigurability and the number of adders was minimized. Constant Shift Method (CSM) had been analyzed; by constant shifts the multiplication operation was performed. When using this method, it consumes more power and speed of the operation also increased. Programmable Shift method was reviewed, the speed of the operation was reduced due to the delay occurred.

III. DATA ENCRYPTION STANDARD (DES)

The Data Encryption Standard (DES) shall consist of the following Data Encryption Algorithm (DES) and Triple Data Encryption Algorithm (TDEA, as described in ANSI X9.52). These devices shall be designed in such a way that they may be used in a computer system or network to provide cryptographic protection to binary coded data. The method of implementation will depend on the application and environment. The devices shall be implemented in such a way that they may be tested and validated as accurately performing the transformations specified in the following algorithms.

3.1. Introduction

The algorithm is designed to encipher and decipher blocks of data consisting of 64 bits under control of a 64-bit key. Deciphering must be accomplished by using the same key as for enciphering, but with the schedule of addressing the key bits altered so that the deciphering process is the reverse of the enciphering process.

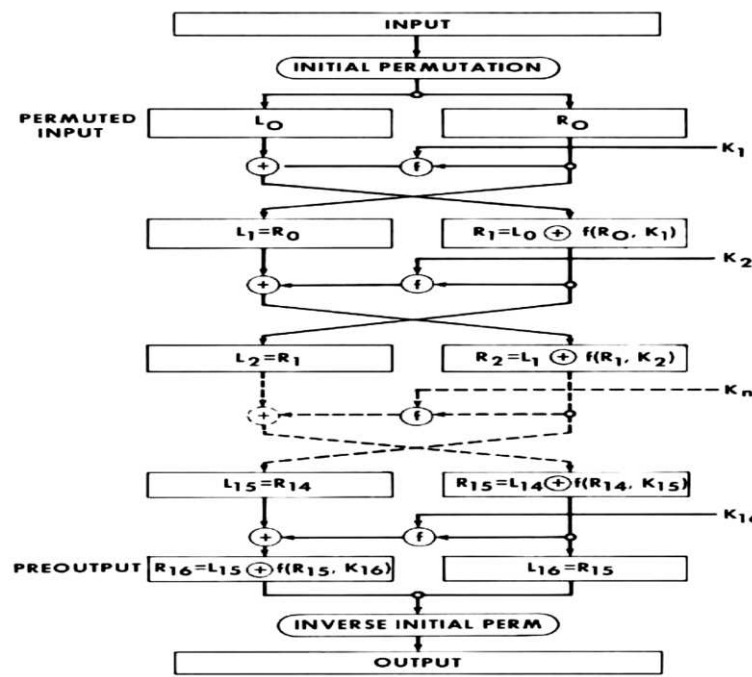


Figure 1: Enciphering computation

The following notation is convenient: Given two blocks **L** and **R** of bits, **LR** denotes the block consisting of the bits of **L** followed by the bits of **R**. Since concatenation is associative, **B1B2...B8**, for example, denotes the block consisting of the bits of **B1** followed by the bits of **B2**...followed by the bits of **B8**?

3.2. Enciphering

A sketch of the enciphering computation is given in **Figure 1**. The 64 bits of the input block to be enciphered are first subjected to the following permutation, called the initial permutation **IP**.

Table 1 : Initial permutation table

58	50	42	34	26	18	10	2
60	52	44	36	28	20	12	4
62	54	46	38	30	22	14	6
64	56	48	40	32	24	16	8
57	59	41	33	25	17	9	1
59	51	43	35	27	19	11	3
61	53	45	37	29	21	13	5
63	55	47	39	31	23	15	7

That is the permuted input has bit 58 of the input as its first bit, bit 50 as its second bit, and so on with bit 7 as its last bit. The permuted input block is then the input to a complex key-dependent computation described below.

That is, the output of the algorithm has bit 40 of the preoutput block as its first bit, bit 8 as its second bit, and so on, until bit 25 of the preoutput block is the last bit of the output.

3.3. Deciphering

The permutation IP^{-1} applied to the preoutput block is the inverse of the initial permutation IP applied to the input. Further, from it follows that:

$$(4) R = L' L = R' \square \square f(L', K)$$

Consequently, to decipher it is only necessary to apply the very same algorithm to an enciphered message block, taking care that at each iteration of the computation the same block of key bits K is used during decipherment as was used during the encipherment of the block. Using the notation of the previous section, this can be expressed by the equations:

$$(5) R_{n-1} = L_n L_{n-1} = R_n \square \square f(L_n, K_n)$$

3.4. The Cipher Function f

A sketch of the calculation of $f(R, K)$ is given in **Figure 2**.

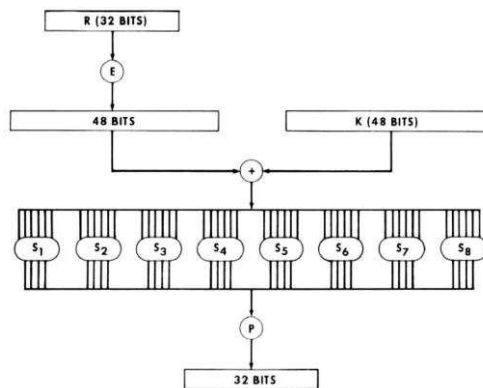


Figure 2: Calculation of $f(R, K)$

Let E denote a function which takes a block of 32 bits as input and yields a block of 48 bits as output. Let E be such that the 48 bits of its output, written as 8 blocks of 6 bits each, are obtained by selecting the bits in its inputs in order according to the following table:

S1

Column Number

Row No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	14	4	13	1	2	15	11	8	3	10	6	12	5	9	0	7
1	0	15	7	4	14	2	13	1	10	6	12	11	9	5	3	8
2	4	1	14	8	13	6	2	11	15	12	9	7	3	10	5	0
3	15	12	8	2	4	9	1	7	5	11	3	14	10	0	6	13

If **S1** is the function defined in this table and **B** is a block of 6 bits, then **S1(B)** is determined as follows: The first and last bits of **B** represent in base 2 a number in the range 0 to 3. Let that number be *i*. The middle 4 bits of **B** represent in base 2 a number in the range 0 to 15. Let that number be *j*. Look up in the table the number in the *i*th row and *j*th column. It is a number in the range 0 to 15 and is uniquely represented by a 4 bit block. That block is the output **S1(B)** of **S1** for the input **B**. For example, for input 011011 the row is 01, that is row 1, and the column is determined by 1101, that is column 13. In row 1 column 13 appears 5 so that the output is 0101. Selection functions **S1, S2,...,S8** of the algorithm appear in Appendix 1.

3.5. Triple Data Encryption Algorithm

Let **EK (I)** and **DK (I)** represent the DES encryption and decryption of **I** using DES key **K** respectively. Each TDEA encryption/decryption operation (as specified in ANSI X9.52) is a compound operation of DES encryption and decryption operations. The following operations are used:

1. TDEA encryption operation: the transformation of a 64-bit block **I** into a 64-bit block **O** that is defined as follows:

$$\mathbf{O} = \mathbf{EK3}(\mathbf{DK2}(\mathbf{EK1}(\mathbf{I}))).$$

2. TDEA decryption operation: the transformation of a 64-bit block **I** into a 64-bit block **O** that is defined as follows:

$$\mathbf{O} = \mathbf{DK1}(\mathbf{EK2}(\mathbf{DK3}(\mathbf{I})))$$

The standard specifies the following keying options for bundle (**K1, K2, K3**)

- 1.Keying Option 1: **K1, K2** and **K3** are independent keys;
- 2.Keying Option 2: **K1** and **K2** are independent keys and **K3 = K1**;
- 3.Keying Option 3: **K1 = K2 = K3**.

3.6. Primitive Functions For The Data Encryption Algorithm

The choice of the primitive functions **KS, S1,..., S8** and **P** is critical to the strength of an encipherment resulting from the algorithm. Specified below is the recommended set of functions, describing **S1,...,S8** and **P** in the same way they are described in the algorithm. For the interpretation of the tables describing these functions, see the discussion in the body of the algorithm. The primitive functions **S1,...,S8** are:

S_1

14	4	13	1	2	15	11	8	3	10	6	12	5	9	0	7
0	15	7	4	14	2	13	1	10	6	12	11	9	5	3	8
4	1	14	8	13	6	2	11	15	12	9	7	3	10	5	0
15	12	8	2	4	9	1	7	5	11	3	14	10	0	6	13

S_2

15	1	8	14	6	11	3	4	9	7	2	13	12	0	5	10
3	13	4	7	15	2	8	14	12	0	1	10	6	9	11	5
0	14	7	11	10	4	13	1	5	8	12	6	9	3	2	15
13	8	10	1	3	15	4	2	11	6	7	12	0	5	14	9

S_3

10	0	9	14	6	3	15	5	1	13	12	7	11	4	2	8
13	7	0	9	3	4	6	10	2	8	5	14	12	11	15	1
13	6	4	9	8	15	3	0	11	1	2	12	5	10	14	7
1	10	13	0	6	9	8	7	4	15	14	3	11	5	2	12

S_4

7	13	14	3	0	6	9	10	1	2	8	5	11	12	4	15
13	8	11	5	6	15	0	3	4	7	2	12	1	10	14	9
10	6	9	0	12	11	7	13	15	1	3	14	5	2	8	4
3	15	0	6	10	1	13	8	9	4	5	11	12	7	2	14

3.7. DES Algorithm:

DES is a symmetric block cipher algorithm, which encrypts and decrypts 64-bit blocks of data using an initial 64-bit key. Although the key length is 64-bit long, the effective key length is only 56 bits because of the parity drop in (PC-1), which drops the bits (8, 16, 24, 32, ..., and 64) from the 64-bit initial key. The Mangler function (F) contains three boxes: Expand (E), Substitution (S), and Permutation.

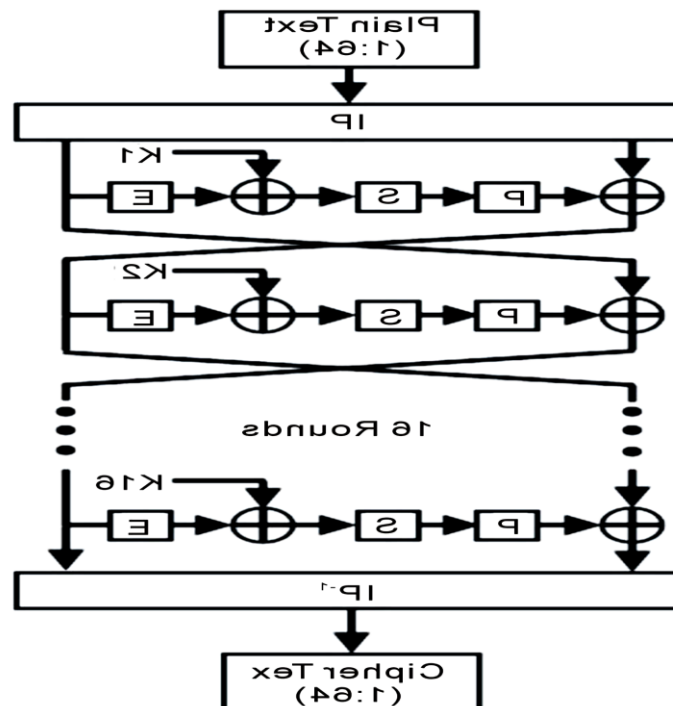


Figure 3: DES structure

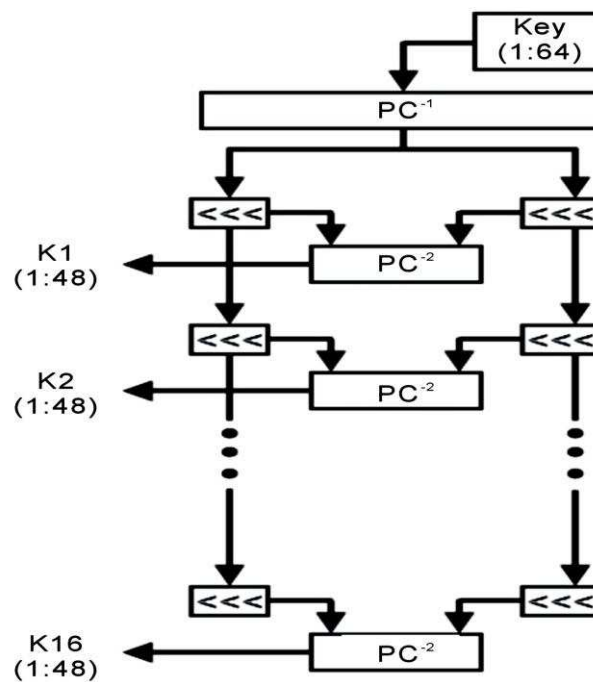


Figure 4: key schedule process

Recall that K_n , for $1 \leq n \leq 16$, is the block of 48 bits in (2) of the algorithm. Hence, to describe KS, it is sufficient to describe the calculation of K_n from KEY for $n = 1, 2, \dots, 16$. That calculation is illustrated in Figure 5. To complete the definition of KS it is therefore sufficient to describe the two permuted choices, as well as the schedule of left shifts.

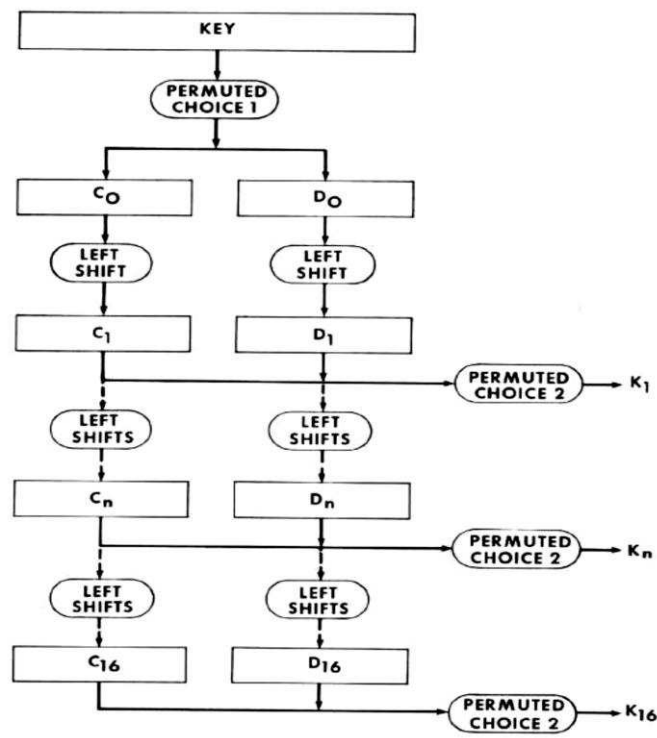


Figure 5: Key schedule calculation

IV. HARDWARE REQUIREMENTS

4.1. Field Programmable Gate Array (FPGA)

Field Programmable Gate Arrays are called this because rather than having a structure similar to a PAL or other programmable device, they are structured very much like a gate array ASIC. This makes FPGAs very nice for use in prototyping ASICs, or in places where and ASIC will eventually be used. For example, an FPGA may be used in a design that needs to get to market quickly regardless of cost. Later an ASIC can be used in place of the FPGA when the production volume increases, in order to reduce cost.

4.2. FPGA Architectures

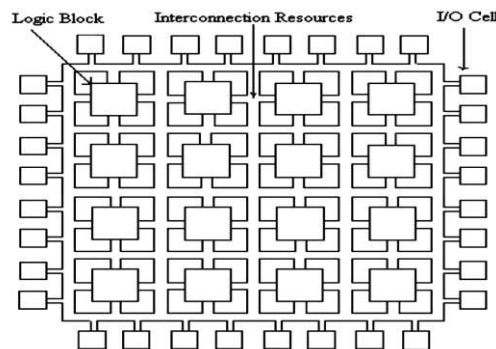


Figure 6: FPGA Architecture

Each FPGA vendor has its own FPGA architecture, but in general terms they are all a variation of that shown in Figure 5.1. The architecture consists of configurable logic blocks, configurable I/O blocks, and programmable interconnect. Also, there will be clock circuitry for driving the clock signals to each logic block, and additional logic resources such as ALUs, memory, and decoders may be available. The two basic types of programmable elements for an FPGA are Static RAM and anti-fuses.

4.3. Configurable Logic Blocks

Configurable Logic Blocks contain the logic for the FPGA. In large grain architecture, these CLBs will contain enough logic to create a small state machine. In fine grain architecture, more like a true gate array ASIC, the CLB will contain only very basic logic[26]. The diagram in Figure 5.2 would be considered a large grain block.

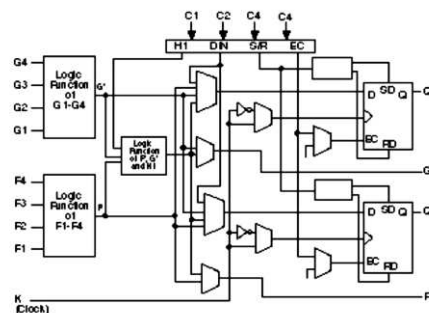


Figure 7: FPGA Configurable Logic Block

4.4. Configurable I/O Blocks

A Configurable I/O Block, shown in Figure 5.3, is used to bring signals onto the chip and send them back off again. It consists of an input buffer and an output buffer with three state and open collector output controls. Typically there are pull up resistors on the outputs and sometimes pull down resistors. The polarity of the output can usually be programmed for active high or active low output and often the slew rate of the output can be programmed for fast or slow rise and fall times.

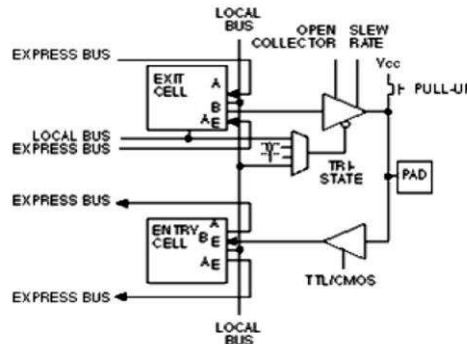


Figure 8: FPGA Configurable I/O Block

4.5. Programmable Interconnect

The interconnect of an FPGA is very different than that of a CPLD, but is rather similar to that of a gate array ASIC. In Figure 5.4, a hierarchy of interconnect resources can be seen. There are long lines which can be used to connect critical CLBs that are physically far from each other on the chip without inducing much delay. They can also be used as buses within the chip. There are also short lines which are used to connect individual CLBs which are located physically close to each other.

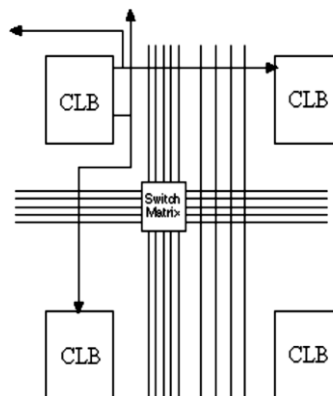


Figure 9: FPGA Programmable Interconnect

4.6. Clock Circuitry

Special I/O blocks with special high drive clock buffers, known as clock drivers, are distributed around the chip. These buffers are connected to clock input pads and drive the clock signals onto the global clock lines described above. These clock lines are designed for low skew times and fast propagation times.

4.7. FPGA design flow

In this part of tutorial we are going to have a short intro on FPGA design flow. A simplified version of design flow is given in the flowing diagram.

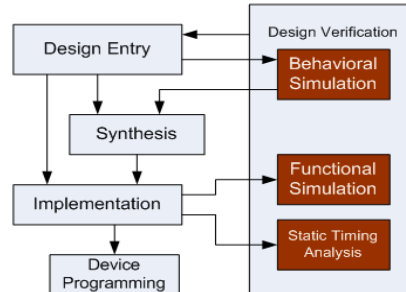


Figure 10: FPGA Design Flow

4.8. Design Entry

There are different techniques for design entry. Schematic based, Hardware Description Language and combination of both etc. . Selection of a method depends on the design and designer. If the designer wants to deal more with Hardware, then Schematic entry is the better choice. When the design is complex or the designer thinks the design in an algorithmic way then HDL is the better choice. Language based entry is faster but lag in performance and density.

4.9. Synthesis

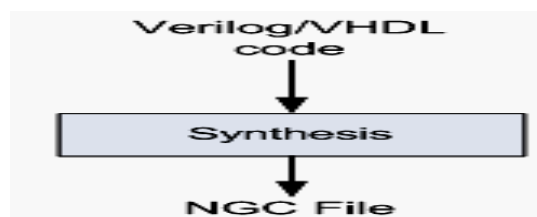


Figure 11: FPGA Synthesis

The process that translates VHDL/ Verilog code into a device netlist format i.e. a complete circuit with logical elements (gates flip flop, etc...) for the design. If the design contains more than one sub designs, ex. to implement a processor, we need a CPU as one design element and RAM as another and so on, then the synthesis process generates netlist for each design element Synthesis process will check code syntax and analyze the hierarchy of the design which ensures that the design is optimized for the design architecture, the designer has selected.

4.10. Implementation

This process consists of a sequence of three steps

- Translate
- Map
- Place and Route

Translate:

Process combines all the input netlists and constraints to a logic design file. This information is saved as a NGD (Native Generic Database) file. This can be done using NGD

Build program. Here, defining constraints is nothing but, assigning the ports in the design to the physical elements (ex. pins, switches, buttons etc) of the targeted device and specifying time requirements of the design. This information is stored in a file named UCF (User Constraints File). Tools used to create or modify the UCF are PACE, Constraint Editor Etc.

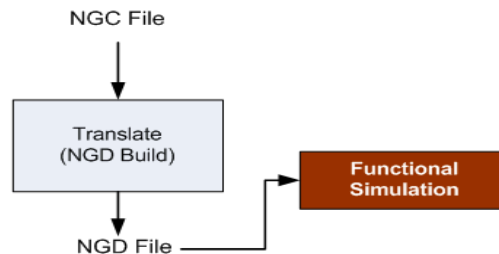


Figure 12: FPGA Translate

V. RESULTS

The low power and area efficient architecture of pulse shaping FIR filter for digital up converter has been designed and simulated using Xilinx. The parameters considered for the designed architecture are area and speed. The serial input data is passed to the data generator to sample the input which are then processed and produced the output based on the selected values of the selection lines of the multiplexer. In coefficient generator, the sections are first coding pass, second coding pass, partial product generator, multiplexer unit and addition unit are processing the inputs and produced the output based on the coded coefficients. For coefficient generator, the inputs are taken from the output of the data generator. Each section of the coefficient generator produces the 16-bit output. Then coefficient selector takes the input from the output of the coefficient generator and it will steer the proper data based on selection lines. Finally, the final accumulation block produces the filter output by summing up all the outputs.

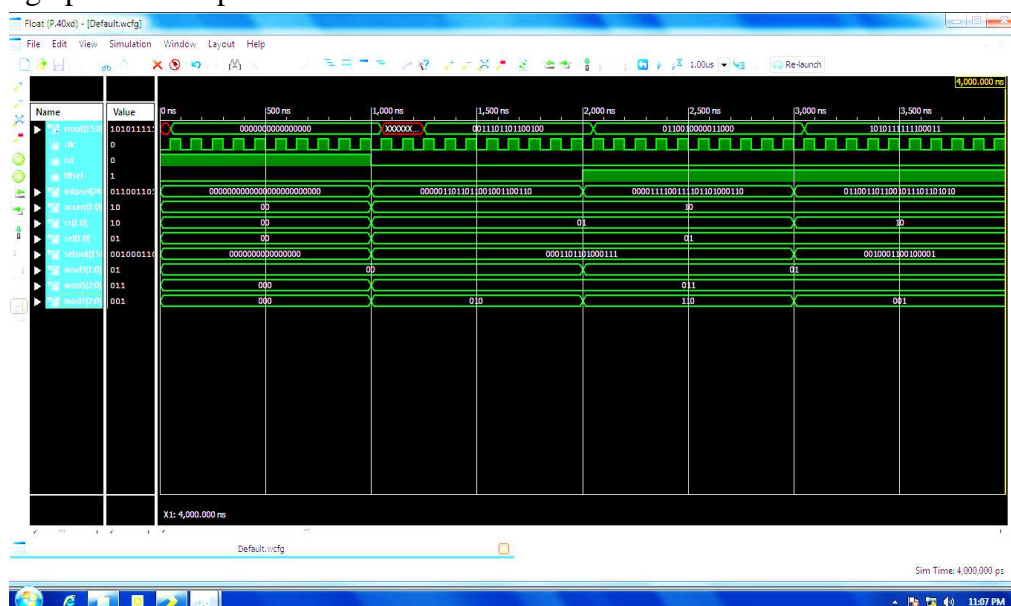


Figure 13: Output Waveform

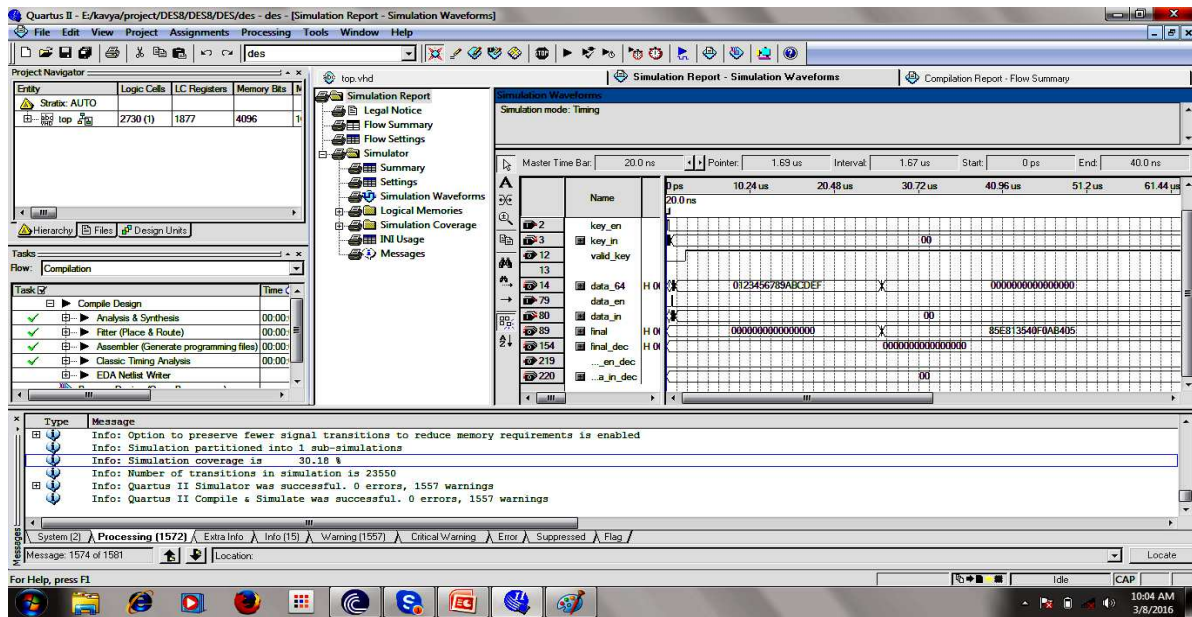


Figure 14: DES encryption waveform

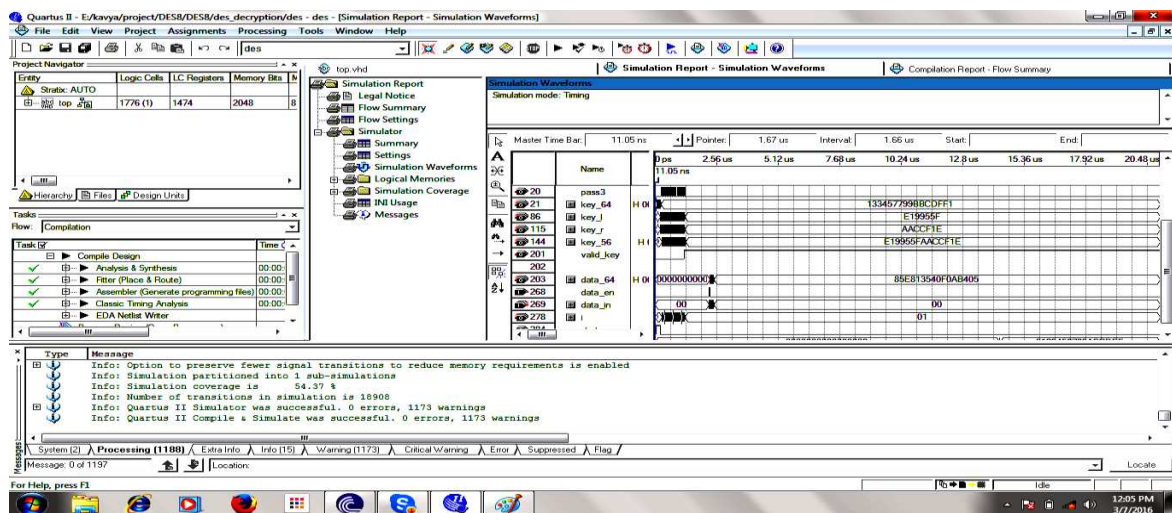


Figure 15: DES decryption waveform

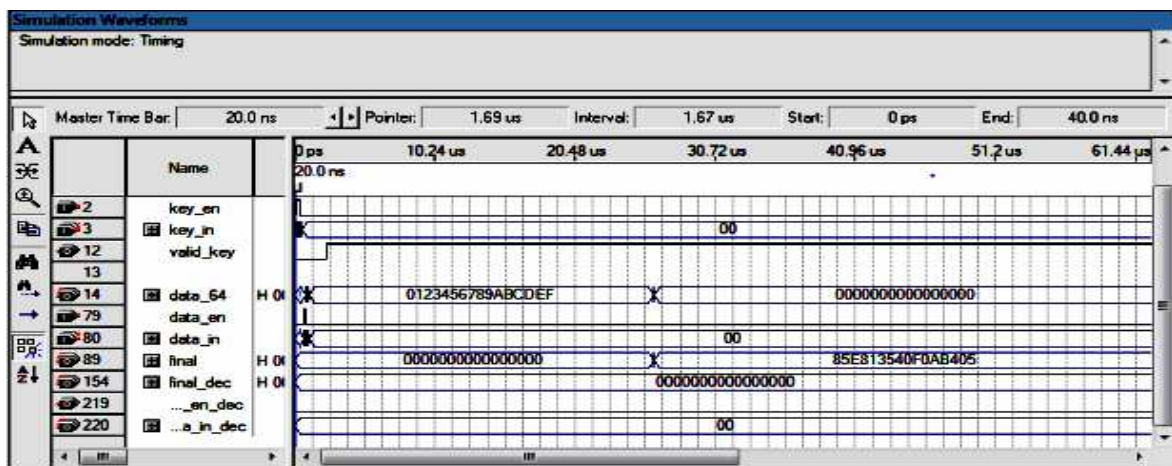


Figure 16: Encryption inputs and corresponding outputs

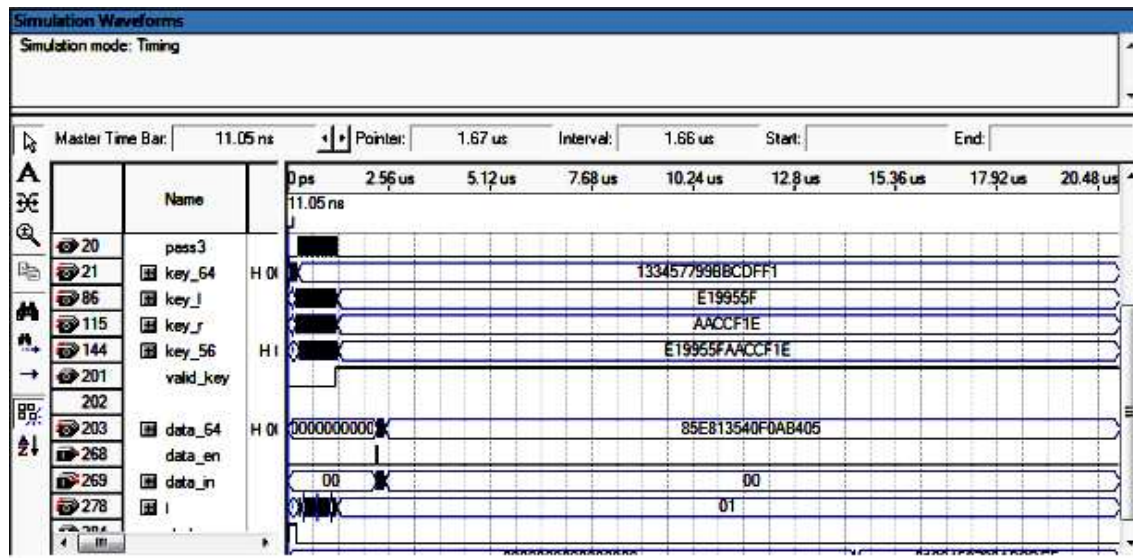


Figure 17: Decryption inputs and corresponding outputs

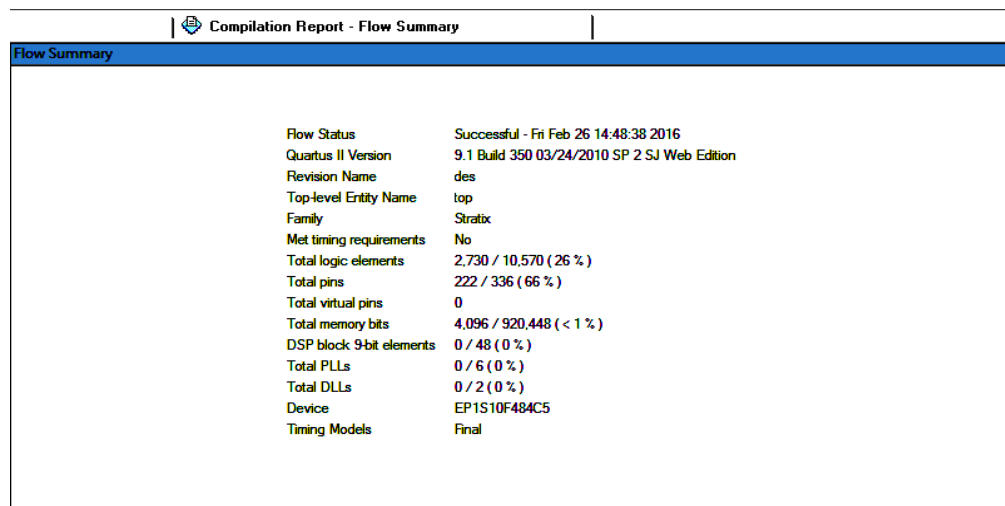


Figure 18: Encryption Compilation Report

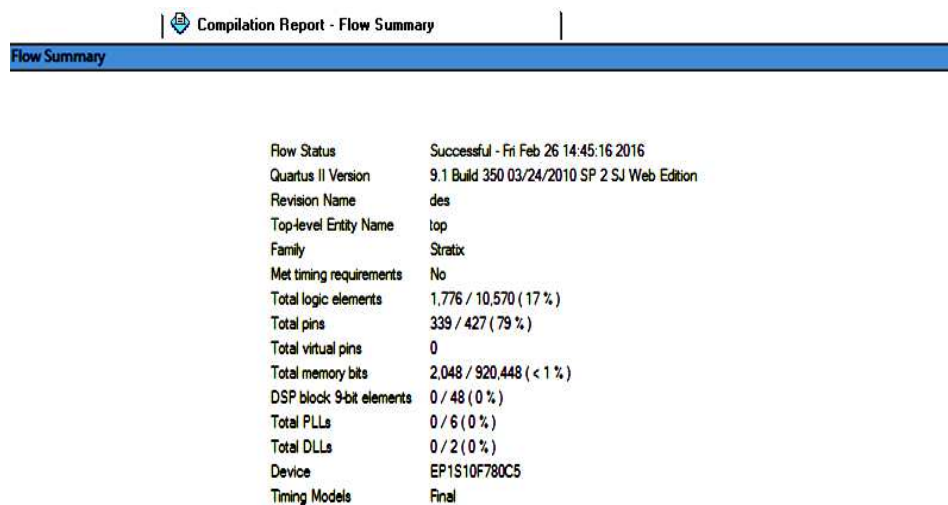


Figure 19: Decryption compilation report

VII. CONCLUSION

In this paper, reconfigurable pulse shaping FIR filter was designed for multi-standard digital up converter for Software Defined Radio system. The complexity of area is caused by the multipliers. The modification to the architecture is included by which carry save adder was used to reduce the power and area consumption. So that the speed of the operation gets increased and also area of the architecture gets minimized. While using this technique, the additions and multiplications were reduced for generating the partial products.

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Creativity among Secondary Students in relation to Gender and Residence

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1 st	Abhijit Paul	Research Scholar, Department of Education, Sidho-Kanho-Birsha University, Purulia, West Bengal
2 nd	Tapas Karmakar	
3 rd	Agamani Mondal	
4 th	Birbal Saha	Professor, Department of Education, Sidho-Kanho-Birsha University, Purulia, West Bengal

Abstract

The present study was conducted to provide information about creativity with regard to gender and residence as well as interaction between gender and resident of 9th grade students of Purulia district, West Bengal in India. Torrance Test of Creative Thinking (TTCT) standardized by Dibakar Kundu in Bengali version was adopted for measuring creativity. 244 samples were selected by stratified random sampling technique. ANOVA, t test were performed using SPSS 17 software. This study revealed that boys are more creative than girls and there is no significant difference exists between rural and urban students. Further, there is no significant interaction between gender and residence with regard to creativity.

I. INTRODUCTION

Creativity is essentially a human phenomenon. It refers to the singularly complex human capacity to produce novel ideas, generate new solutions, and express oneself in a unique manner (Runco et.al. 2010). A creative response is one that is determined to be both original and relevant (Runco and Jaeger 2012; Baron 1969). It is an ability open new ways for world to find hidden pattern, to make connections between unrelated phenomena to generate solution (Arieti, 1976). The Torrance Tests of Creative Thinking (TTCT) are one of the best

measures of creativity (Almeida, Prieto Prieto, Ferrando, Oliveira, & Ferrandiz, 2008) and the most widely used tests to identify the creative thinking abilities of individuals.

Creativity literature implies that individuals' personal traits have some influence on creativity (Ai, 1999; Batey and Furnham, 2006). Among these personal characteristics, gender is one of the investigated targets (Kogan, 1974; Charyton, 2006). The role of gender in creativity has been explored to determine not only in terms of creative ability, but also what factors contribute to the likely differences and whether these manifest differentially over the course of the lifetime, as suggested by recent studies (Abraham, 2015; Bender et al. 2013; Cheung and Lau 2010; He and Wong 2011; Sayed and Mohamed 2013; Stoltzfus et al. 2011). According to the literature, the results are mixed (Barron and Harrington, 1981). Some studies revealed no gender difference between males and females (Baer and Kaufman, 2008, Charyton and Snelbecker, 2007, whereas others revealed that gender differences in creative performance do exist (Hoff, 2005). Abra (1991) asserted that the significance of investigating creativity depends essentially on the socio-cultural differences among both girls and boys. Socio-cultural factors (Saha, 2012) could affect girls and boys differentially, including the development of their creative capabilities. Goldsmith and Matherly (1988) gave 118 college students three self-report measures of creativity and found no gender differences. Shair (1988) try to explore creative thinking among boys and girls in relation to Socio-economic status. The result shows that Creativity and SES were positively related and no gender difference mere found to exist in creativity. Conti, Collins and Picariello (2001) found that girls were less creative in competitive situations and boys were more creative in competitive situations. Mitra Ghosh (2013) studies gender differences in creativity among School Students and found that there was a significant difference between boys and girls on creativity. Lau and Li (1996) studied 633 Chinese students in grade five in Hong Kong. Among, students, boys were viewed to be more creative than girls.

Residence may play an important role in fostering creativity because of diversified experience acquired by the students. Passi (1972), Trimurthy (1987), Reddy and Rao (2003) found that urban students are more creative whereas Sharma (1971, 1974) found that rural are more creative. On the other hand, Joshi (1982), Chadrakanta (1987) found no significant difference in creativity between rural and urban participants.

With that as background, the purpose of this paper is to examine gender differences as well as residence difference in the creative thinking abilities of 9th grade students in Purulia Districts of West Bengal by addressing the following research questions: (a) Are there any differences between males and females among 9th graders in as measured by the TTCT? (b) Are there any differences between rural and urban 9th graders as measured by the TTCT? (c) Are there any significant interaction between residence and gender on Creativity?

II. HYPOTHESES OF THE STUDY

The null hypotheses for the present study are as follows:

Ho₁: There is no significant difference between male and female students with regard to Creativity.

H_{02} : There is no significant difference between urban and rural students with regard to Creativity.

H_{03} : There is no significant interaction between gender and resident with regard to Creativity.

III. PARTICIPANTS

All 9th standard students of Purulia district in West Bengal, India are the population of the study. A sample of 244 students including male, female, urban and rural areas in Purulia districts were selected randomly. The samples are consisted with 120 male and 124 female of 9th standard students. The sample profile is given in Table 1.

Table 1: Sample profile

	Urban	Rural	Total
Male	57	63	120
Female	76	48	124
Total	133	111	244

IV. TOOLS OF THE STUDY

This study made use of TTCT Figural, Form A. It provides scores for five subtests: (1) Fluency, (2) Originality; (3) Elaboration; (4) Abstractness of titles; and (5) Resistance to closure. This form includes three activities: picture completion, repeated figures of lines or circles, and picture construction, each of which lasts 10 min (Torrance, 1974, 1990, 1998, 2008).

V. ANALYSIS OF THE DATA

The investigation of the gender and residence differences in creativity among 9th grade students involved the analysis of data with the use of one-way ANOVAs (Table 2). However, in order to analysis interaction between variables, two way ANOVA (Table 2) was calculated. In addition, t critical ratios (Table 3) were also calculated. All of the above statistics are very helpful in hypotheses testing.

Table 2: Summary of ANOVA results

Source of variation	SS	df	MS	F ratio
A (Gender)	989.906	1	989.906	9.894
B (Residence)	117.243	1	117.243	1.172
A × B	206.410	1	206.410	2.063
Within group	24011.811	240		

Table 3: Showing mean and S.D along with t-critical ratio

Pair of comparison	N	Mean	S.D	df	t-value
Male	120	29.54	10.90	242	3.20*
Female	124	25.42	9.10		
Rural	111	28.52	11.69	242	1.50**
Urban	133	26.55	9.01		

*Significance at 0.05 level. **Not significance at 0.01 level.

VI. RESULTS AND DISCUSSION

Testing of H_{01} :

The mean scores of creativity for male students is 29.54 (S.D= 10.90) and for the female is 25.42 (S.D = 9.10) respectively. F- Value (Table 2) for gender is found to be 9.894. Moreover 't'-value j (Table 3) between Male and Female students is to be found 3.20 which is also significant at 0.01 level of significant. In view of the above H_0^1 is rejected. It means that significant difference exists in creativity between male and female students. The study is support by the findings Ghosh Mitra (2013), Lau and Li (1966), but not with the findings of Goldsmith and Matherly (1988).

Testing of H_{02} :

The mean scores of Creativity or rural students is 28.52 (S.D= 11.69) and for urban score is 26.55 (S.D = 9.01) respectively. F- Value (Table 2) for resident is found to be 1.17 which is not significant at 0.01 levels. Moreover 't'-critical ratio (Table 3) between rural and urban students is to be found 1.50 which is also not significant at 0.01 level of significant. In view of the above H_0^2 is accepted implying that creativity does not dependent on residential place. The findings of the present study corroborates with the findings of Joshi (1982), Chadrakanta (1987), but not with the finding of Sharma (1974), Passi (1971).

Testing of H_{03} :

The interaction between gender and resident of 9th standard students on the creativity is not significant as revealed by F-value which is 2.063 (Table 2). So H_0^3 is accepted.

VII. CONCLUSION

Assessing gender differences in creativity is a controversial line of research to explore. It is naïve and wrong to suggest either that one gender is more creative than another, or that there are absolutely no differences between the sexes (Pinker 2009). Present study indicates that there is significant difference between male and female student with regard to creativity and there is no significant interaction between gender and resident with regard to creativity. So we can conclude that creativity depend on gender but not depend on residence. Efforts should be done to enhance and develop creativity as well its components. Special programs for the same should be conducted.

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Performance of Economic Growth in BRICS Countries

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A. Anu Menon

Assistant Professor,
Department of Commerce,
PSGR Krishnammal College for Women,
Peelamedu, Coimbatore-Tamil Nadu, India

Abstract

Economic growth plays an important role in restructuring economic and social attributes of Countries around the world, particularly the less developed Countries. It is an imperative element of a country's national economy and contributes substantially to the economic well-being of the people and the enlargement of resources. The growth rate and per capita income of an economy depends on the domestic production, consumption activities and in combination with foreign transaction of goods and services. Relevant data were collected from the reports of Ministry of Commerce data. The article purely based on the secondary data for the period of ten years from 2006-2007 to 2015-2016. The collected data were analyzed by using statistical tools namely Mean, Standard Deviation (SD), Co-efficient of Variation (CV), Compound Annual Growth Rate (CAGR). The macro-economic variables used in the study are Exports, Imports, Interest rate, Exchange rate, Inflation rate, Gross Domestic Product, National Income, and Unemployment rate. From the BRICS Countries, Brazil, Russia, and India show a positive influence on Economic growth. Therefore, acquainted efforts should be made by the government to tune the macro-economic variables in order to provide a facilitating environment to arouse Economic Growth.

I. INTRODUCTION

Economic Growth affords a major contribution to the development of Countries. Economic Growth plays a fundamental role in the country's national economy, and subsidizes significantly to the economic welfare of the people and the development of resources. It is a impending weapon for developing an economy and plays an important role in achieving the

country's socio-economic objectives. Hence, a study has been made to identify the economic growth in BRICS Countries during the recent decade.

II. REVIEW OF LITERATURE

- **Peng Sun (2010)** in his study "*International Trade and its Effects on Economic Growth in China*" states that International trade, as a major factor of openness, has made an increasingly significant contribution to Economic Growth. Chinese international trade has experienced rapid expansion together with its dramatic Economic Growth which has made the country to target the world as its market. It discusses the role of international trade in China's Economic Growth and evaluates the effects of international trade on China's Economic Growth through examining improvement in productivity. The author concludes in his study that the results showed the increasing returns to scale in the provincial production function in China during 2002-2007, with the input of capital, labour and investment of R&D investment.
- **Priyanka (2012)** in her study "*Export -Led Growth In India: An Empirical Investigation*" states that the present study attempts to test the mechanisms of Export - Led Growth in India by taking a time- series data from 1980-1981 to 2008-2009. It applies Ordinary Least Square (OLS) method to investigate the relationship between Gross National Product, Total Exports, Manufactured Exports and Investment. The author concluded the results of the study by indicating that there exists a significant and positive relation between exports and Gross National Product (GNP) for the whole period under study.
- **Deepika Kumari and Neena Malhotra(2014)** in their study "*Trade-Led Growth in India and China: A Comparative Analysis*" state that the trade-led growth theory has received considerable attention over the decades with vast amount of literature devoted to analyse it empirically, particularly, in the case of export- led growth hypothesis. India and China are two large Asian Countries experiencing rapid growth during recent decades. Their study aims to examine the impact of exports and imports expansion on Economic Growth for India and China. The study concluded that China performed better as compared to India. The difference in performance between India and China is not simply because of timings of changes in policies but the speed of reforms, implementation of policies and nature of political governance also mattered.

III. STATEMENT OF THE PROBLEM

Economic growth plays a substantial role in reformation economic and social attributes of Countries around the world, especially the developing Countries. Economic Growth is one of the most important goals of both developed and developing Countries. But BRICS Countries suffer from many economic differences such as high rates of inflation, unemployment, chronic deficit in the balance of trade and balance of payment and others. Therefore, Economic growth in BRICS Countries increases competition, high-tech advancements, etc., furthermore, the rapid developing economies stimulated to examine the role of macro-economic variables that instigate in promoting Economic Growth, based on

the above setting the researcher has attempted to find out the answers for the following research questions,

- What is the growth of GDP in BRICS Countries?

IV. OBJECTIVES OF THE STUDY

- To examine the growth of Economic Growth in BRICS Countries.

V. APPLIED RESEARCH DESIGN

The study is based on secondary data and the data reliable for analysis are collected from various reports, publications, magazines, journals, websites and various articles. The collected data have been used for analysis with the help of statistical tools. The various statistical tools used are Mean, Standard Deviation (SD), Co-efficient of Variation (CV), Compound Annual Growth Rate (CAGR), and Average Annual Growth Rate (AAGR). The study covers a period of 10 years from 2006-2007 to 2015-2016.

VI. ANALYSIS AND INTERPRETATION

Growth rate of GDP in BRICS Countries.

Table 1: Annual Growth Rate of GDP in BRICS Countries from 2006-2007 to 2015-2016 (In Percentage)

YEAR	BRAZIL	AAGR	RUSSIA	AAGR	INDIA	AAGR	CHINA	AAGR	S.AFRICA	AAGR
2005-2006	2.18	-----	3.77	-----	4.57	-----	3.86	-----	3.25	-----
2006-2007	3.04	2.04	4.17	3.17	4.58	3.58	4.11	3.11	3.54	2.54
2007-2008	3.53	2.53	4.30	3.3	4.03	3.03	3.72	2.72	3.49	2.49
2008-2009	1.79	0.79	2.49	1.49	3.95	2.95	0.96	-0.04	2.07	1.07
2009-2010	2.66	1.66	3.17	2.17	4.16	3.16	1.15	0.15	0.66	-0.34
2010-2011	3.90	2.9	3.02	2.02	4.60	3.6	3.92	2.92	1.93	0.93
2011-2012	1.75	0.75	2.82	1.82	3.66	2.66	3.11	2.11	2.56	1.56
2012-2013	0.01	-0.63	2.24	1.24	2.92	1.92	0.92	-0.08	1.69	0.69
2013-2014	1.41	0.41	0.41	-0.59	3.65	2.65	2.23	1.23	1.32	0.32
2014-2015	0.61	-0.39	1.40	0.4	3.97	2.97	1.84	0.84	1.50	0.5
2015-2016	0.63	0.52	1.46	0.7	3.99	4.01	1.92	0.90	1.55	0.7
Mean	1.91		2.45		3.92		2.39		2.01	
SD	1.30		1.58		0.57		1.39		1.12	
CV	68.30		64.73		14.58		58.27		55.93	
CAGR	-0.11		-0.09		-0.01		-0.07		-0.07	

Source: Calculated and Compiled from IMF Data

** Trend prediction value

The table 1 revealed the annual growth of GDP in BRICS Countries during the period from 2006-2007 to 2015-2016. The average contribution of BRICS highest is 3.92 per cent in India and followed by 2.45 per cent in Russia, 2.39 per cent in China, 2.01 per cent in South

Africa and 1.91 per cent in Brazil. The Compound Annual growth rates for Brazil -0.11 per cent, followed by Russia -0.09 per cent, India -0.01 per cent, China -0.07 per cent and South Africa -0.07 per cent.

VI. SUGGESTIONS

- From the BRICS Countries, China and South Africa have the negative impact on Economic Growth. So the Countries should concentrate more on the decrease of Inflation rate by monitoring the domestic products and money control. By reducing that it will help to enhance the positive growth for the country.

VII. CONCLUSION

In the light of renovation, Economic Growth has become intrinsic for all the Countries to prosper and to show their worthiness among other competitors. International discussions among the Countries around the globe have proved to be fruitful to the Countries concerned. From the BRICS Countries, Brazil, Russia, and India show a positive influence on Economic Growth. Therefore, perceptive efforts should be made by the government to tune the macro-economic variables in order to provide an empowering environment to stimulate Economic Growth.

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Novel Approaches of Targeting Mycobacterium Tuberculosis – Formulation Prospective

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1 st	Sumit Labhsjetwar	Postgraduate Student, Department of Pharmaceutics, SVKMs NMIMS School of Pharmacy And Technology Management, Shirpur, Dhule, Maharashtra
2 nd	Dr. Chandrakant Bonde	Associate Professor, Department of Pharmaceutical Chemistry, SVKMs NMIMS School of Pharmacy And Technology Management, Shirpur, Dhule, Maharashtra
3 rd	Dr. Smita Bonde	Assistant professor, Department of Quality Assurance, SVKMs NMIMS School of Pharmacy And Technology Management, Shirpur, Dhule, Maharashtra

Abstract

Tuberculosis (TB), an inescapable illness of the respiratory framework, is one of the principle challenges in general wellbeing. The spread of multidrug resistance TB [Multidrug-resistant (MDR) - TB], and the presence of broadly medication resistant TB (XDR-TB) posture new difficulties for its avoidance, treatment, and control. Mycobacterium tuberculosis is a troublesome pathogen to battle and the primary line tranquilizers as of now being used are 40–60 years of age. The requirement for new TB medications is earnest, however an ideal opportunity to distinguish, create and at last progress new medication regimens onto the market has been excruciatingly moderate. Then again, the medications as of now in clinical advancement, and the late picks up in learning of the pathogen and the illness itself give us seek after finding new medication targets and new medication leads. The capacity of the pathogen to form into a torpid state is

the primary snag in beating the illness. It appears that the advancement of intensifies that can target dormant TB is the way to kill this pathogen. In such manner, numerous analysts began to hunt down novel exacerbates that could restrain the action of particles required in the revival of idle bacilli. The disclosures of a greatly powerful hostile to torpidity calculate, a revival advancing element (Rpf) from Micrococcus luteus, moved the thought towards creating strong inhibitors of Rpfs to build up idle TB and stay away from reactivation of the resting pathogen. In any case, other than the benefits of this approach over the use of irritating long haul administrations of harmful anti-toxins, such methodologies that depend on quieting inactive TB have numerous downsides that may scrutinize their application in human research. The real disadvantage of the current methodologies is that they shroud the idle TB as opposed to treating/annihilating it. Here, we propose a novel practical approach that could adequately kill both dynamic and dormant TB in a brief timeframe without having any danger of reactivation.

I. INTRODUCTION

Tuberculosis (TB) is an antiquated infection that has influenced humanity for over 4,000 years [1]. Roughly 33% of the total populace conveys the TB microscopic organisms, around 9.6 million of whom create "dynamic" TB every year, which can be spread to others ("inert TB" illness can't be spread) [2]. It is evaluated that somewhere around 2002 and 2020, roughly 1000 million individuals will be recently contaminated, more than 150 million individuals will become ill, and 36 million will bite the dust of TB - if control is not further reinforced [3]. It is a ceaseless malady brought about by the bacillus Mycobacterium tuberculosis and spreads from individual to individual through air. TB more often than not influences the lungs yet it can likewise influence different parts of the body, for example, cerebrum, digestion systems, kidneys, or the spine. Indications of TB rely on upon where in the body the TB microbes are developing. In the instances of aspiratory TB, it might bring about side effects, for example, endless hack, torment in the mid-section, haemoptysis, shortcoming or weariness, weight reduction, fever, and night-sweats. In creating nations, around 7% of all passings are credited to TB which is the most widely recognized reason for death from a solitary wellspring of contamination among grown-ups [4]. It is the main irresistible illness proclaimed by the World Health Organization (WHO) as a worldwide wellbeing crisis [5]. In 2007, it was evaluated all around that there were 9.27 million occurrence instances of TB, 13.7 million common cases, 1.32 million passings from TB in HIV-contrary and 0.45 million passings in HIV-constructive people [6]. Asia and Africa alone constitute 86% of all cases [7]. Execution of specifically watched treatment short course (DOTS) has been an "achievement" in the control of tuberculosis. In numerous nations, it has turned into the foundation in the treatment of tuberculosis. The quantity of nations and the scope of DOTS inside the nations have expanded throughout the years [8].

Execution of DOTS was begun in 1993 in Bangladesh, and it steadily secured the entire nation [9]. Men are more regularly influenced than ladies. The case notices in many nations are higher in guys than in females. There were 1.4 million spread positive TB cases in men and 775,000 in ladies in 2004 [10]. The proportion of female to male TB cases told comprehensively is 0.47:0.67 [11]. The purposes behind these sexual orientation contrasts are not clear. These might be because of contrasts in the pervasiveness of contamination, rate of movement from contamination to ailment, under-reporting of female cases, or the distinctions in access to administrations. The relationship amongst neediness and TB is all around perceived, and the most astounding rates of TB were found in the poorest segment of the group [12]. TB happens all the more oftentimes among low-wage individuals living in packed ranges and people with small tutoring [13]. Destitution may bring about poor nourishment which might be connected with changes in resistant capacity. Then again, destitution bringing about packed living conditions, poor ventilation, and poor cleanliness propensities is probably going to expand the danger of transmission of TB [14]. Different reviews have been directed to comprehend the learning, states of mind, and works on with respect to tuberculosis [15-16]. One overview in India reported that most (93%) individuals had known about TB yet just 20.5% of the general population exhibited adequate learning of TB [15]. A sedate safe strain of TB is quickly rising around the world [17]. The WHO reported disturbing ascent of multidrug-safe (MDR) TB as well as of XDR TB (outrageous medication safe TB) all inclusive. The demise rate in MDR cases is high (50-60%) and is frequently connected with a limited ability to focus sickness (4-16 weeks) [18]. A few components have been distinguished for the advancement of MDR cases. These incorporate non adherence to treatment, absence of direct watched treatment, restricted or intruded on medication supplies, low quality of medications, far reaching accessibility of hostile to TB drugs without medicine, poor restorative administration, and ineffectively oversaw national control programs [19-21]. The analysis of TB among youngsters is troublesome. In addition, youthful kids can't deliver sputum. Gauges show that kids constitute around 10% of all new cases in high-load territories [22]. Clinical signs and side effects and scoring framework have been utilized for the finding of TB among youngsters [22]. Different symptomatic strategies have been utilized for enhancing the determination among kids. These incorporate culture, serodiagnosis, and nucleic corrosive enhancement [23].

II. GLOBAL BURDEN

TB is an overall wellbeing issue. 27% of the worldwide populaces – around 1.9 billion individuals presently have inert TB. Strangely, 80% of the worldwide weight is borne by just 22 nations. Actually, India and China bear 33% of the aggregate TB burden [24]. The World Health Organization (WHO) evaluated that 1.4 million individuals passed on from tuberculosis in 2010. An expected 12% of occurrence cases happened in patients who were HIV positive [25].

Table 1 : Global incidence TB burden

WHO region	Incidence TB (in thousands)
Africa	2800

Americas	270
Eastern Mediterranean	660
Europe	420
Southeast Asia	3300
Western Pacific	3300
Total:	10,750

Drug resistance and the developing worldwide nearness of medication safe tuberculosis are disturbing. Around 3% of cases are multidrug safe (MDR – characterized as impervious to both rifampicin and isoniazid).

Table 2 : Global incidence MDR-TB burden

WHO region	Incidence MDR-TB (in thousands)
Africa	69
Americas	8.2
Eastern Mediterranean	24
Europe	81
Southeast Asia	130
Western Pacific	120
Total:	432.2

The four countries with the highest incidence of MDR-TB were:

1. China: 100,000 cases
2. India: 99,000 cases
3. The Russian Federation: 38,000 cases
4. South Africa: 13,000 cases

In 2010, the assessed occurrence expanded to 650,000 instances of MDR-TB [25]. The WHO reported that starting July 2010 58 nations reported as minimum one instance of widely medication safe TB (XDR-TB, characterized as MDR + impervious to no less than a fluoroquinolone and an aminoglycoside).

2.1. Etiology

The main cause of TB is *Mycobacterium tuberculosis*, a small, aerobic, non motile bacillus [26]. The high lipid content of this pathogen accounts for many of its unique clinical characteristics [27]. It divides every 16 to 20 hours, which is an extremely slow rate compared with other bacteria, which usually divide in less than an hour [28].

The *M. tuberculosis* complex (MTBC) includes four other TB-causing mycobacteria: *M. bovis*, *M. africanum*, *M. Canetti*, and *M. microti* [29]. *M. africanum* is not widespread, but it is a significant cause of tuberculosis in parts of Africa [30-31]. *M. bovis* was once a common cause of tuberculosis, but the introduction of pasteurized milk has almost completely eliminated this as a public health problem in developed countries [32-33]. *M. Canetti* is rare and seems to be limited to the Horn of Africa, although a few cases have been seen in African emigrants [34-35]. *M. microti* is also rare and is seen almost only in immunodeficient people, although its prevalence may be significantly underestimated [36].

Other known pathogenic mycobacteria includes *M. leprae*, *M. avium*, and *M. kansasii*. The latter two species are classified as "nontuberculous mycobacteria" (NTM). NTM cause neither TB nor leprosy, but they do cause pulmonary diseases that resemble TB [37].

Table 3: Forms Of TB : Latent V/S Active TB [38-39]

Latent TB Infection	Active TB Disease
TB germs are dormant (asleep) in your body. This phase can last for a very long time - even decades.	TB germs are reproducing and spreading in your body, causing tissue damage.
You don't look or feel sick. Your chest x-ray usually is normal.	You usually feel sick. Typical symptoms include: cough lasting >3 weeks, weight loss, night sweats, and fever. A chest x-ray and other tests are needed to diagnose TB disease.
You can't spread TB to other people.	If the TB germs are in your lungs or voicebox, you may spread TB to other people by coughing, sneezing, talking, or singing.
Usually treated by taking one medicine for 9 months.	Treated by taking three or four medicines for at least 6 months.
Usually has a skin test or blood test result indicating TB infection	Usually has a skin test or blood test result indicating TB infection
Has a normal chest x-ray and a negative sputum test	May have an abnormal chest x-ray, or positive sputum smear or culture
Has TB bacteria in his/her body that are alive, but inactive	Has active TB bacteria in his/her body
Does not feel sick	Usually feels sick and may have symptoms such as coughing, fever, and weight loss
Cannot spread TB bacteria to others	May spread TB bacteria to others
Needs treatment for latent TB infection to prevent TB disease; however, if exposed and infected by a person with multidrug-resistant TB (MDR TB) or extensively drug-resistant TB (XDR TB), preventive treatment may not be an option	Needs treatment to treat active TB disease
Diagnosis of the dormant form is different because patient represents the asymptomatic signs of TB and this form persists against antibiotic regimes [40].	Diagnosis of the active form is easy because patient represents the symptomatic signs of TB and this form is susceptible to a standard antibiotic regime [41].

2.2. Cell Wall Structure :

The cell divider structure of *Mycobacterium tuberculosis* merits exceptional consideration since it is novel among procaryotes, and it is a noteworthy determinant of destructiveness for the bacterium. The cell divider complex contains peptidoglycan, yet else it is made out of complex lipids. More than 60% of the mycobacterial cell divider is lipid. The lipid portion of MTB's cell divider comprises of three noteworthy segments, mycolic acids, string component, and wax-D. Mycolic acids are one of a kind alpha-extended lipids found in cell

dividers of Mycobacterium and Corynebacterium. They make up half of the dry weight of the mycobacterial cell envelope. Mycolic acids are solid hydrophobic atoms that frame a lipid shell around the life form and influence porousness properties at the cell surface. Mycolic Acids are thought to be a noteworthy determinant of destructiveness in MTB. Presumably, they forestall assault of the mycobacteria by cationic proteins, lysozyme, and oxygen radicals in the phagocytic granule. They additionally shield extracellular mycobacteria from supplement testimony in serum. [42]

Line Factor is in charge of the serpentine cording said above. Line component is lethal to mammalian cells and is additionally an inhibitor of PMN movement. Line element is most bounteously delivered in harmful strains of MTB.

Wax-D in the cell envelope is the significant segment of Freund's finished adjuvant (CFA). The high centralization of lipids in the cell mass of Mycobacterium tuberculosis has been connected with these properties of the bacterium: Impermeability to stains and colors, Imperviousness to numerous anti-toxins, Imperviousness to murdering by acidic and antacid mixes. Imperviousness to osmotic lysis by means of supplement affidavit, Imperviousness to deadly oxidations and survival within macrophages.

III. BACKGROUND

3.1 Current Therapy for TB:

Drugs accessible for the treatment of tuberculosis can be grouped into two classifications; first line medications, for example, isoniazid (INH), rifampin (RIF), pyrazinamide (PZA), ethambutol (EMB) and so forth., and second line drugs like para amino salicylate (PAS), kanamycin, cycloserine (CS), ethionamide (ETA), amikacin, capreomycin, thiacetazone, fluoroquinolones and so on. Current TB treatment, otherwise called DOTS (specifically watched treatment, short-course) comprises of an underlying period of treatment with 4 drugs, INH, RIF, PZA and EMB, for 2 months every day, trailed by treatment with INH and RIF for an additional 4 months, three times each week [43]. The objectives of these medications are shifted. INH, hinders amalgamation of mycolic corrosive, a cell wall part [44]. PZA targets cell layer though rifampin and streptomycin meddles with the start and streptomycin meddles with the start of RNA and protein amalgamation separately [45]. EMB pieces biosynthesis of arabinogalactan, a noteworthy polysaccharide show in the mycobacterial cell divider [46] and kanamycin and capreomycin, similar to streptomycin, restrain protein combination through adjustment of ribosomal structures at the 16S rRNA [47]. Cycloserine keeps the combination of peptidoglycan, a constituent of cell divider [48]. The best of the present TB drugs at executing effectively reproducing tubercle bacilli is isoniazid, while rifampin, an inhibitor of RNA combination, is dynamic against both duplicating and non-recreating or gradually imitating microscopic organisms [49]. Clinical advantage from utilization of pyrazinamide is just observed amid the initial 2 months of treatment and the medication is accepted to be compelling against moderately gradually duplicating bacilli [50]. The blend of rifampin and pyrazinamide assumed a noteworthy part

in shortening the term of treatment of dynamic sickness from the first 18 to 24 months to the present 6 to 9 months [51].

Table 4: Year of Discovery, Main Characteristics and Most Frequently Reported Adverse Reactions of First and Second Line TB Drugs

First Line Drugs					
Drug	Year discovered	MOA	Route	Daily Dose	Major Adverse Reactions
Isoniazid	1952	Cell wall synthesis inhibitor	P Os	5 mg/kg (max 300 mg)	Hepatitis, peripheral neuropathy, lupus-like syndrome, drug interactions
Rifampin	1966	RNA synthesis Inhibitor	P Os	10 mg/kg (max 600 mg)	Drug interactions, orange color of body fluids, GI, hepatitis, fever, acute renal failure, hemolytic anemia
Pyrazinamide	1952	Disruption of electron transport across the membrane	P Os	15-30 mg/kg (max 2 g)	Hyperuricemia, gouty arthritis, rarely nephritis
Ethambutol	1961	Cell wall synthesis inhibitor	P Os	15-25 mg/kg	Optic neuritis, exfoliative rash
Second line drugs					
Drug	Year discovered	MOA	Route	Daily Dose	Major Adverse Reactions
Streptomycin	1944	Protein synthesis inhibitor	IV/IM	15 mg/kg	Cochlear and vestibular toxicity, nephrotoxicity
Capreomycin	1956	Protein synthesis inhibitor	P Os	15-30 mg/kg	Cochlear and vestibular toxicity, nephrotoxicity
Kanamycin	1957	Protein synthesis inhibitor	IV/IM	15-30 mg/kg	Cochlear and vestibular toxicity, nephrotoxicity
Amikacin	1974	Protein synthesis inhibitor	IV/IM	15-30 mg/kg	Cochlear and vestibular toxicity, nephrotoxicity
Ethionamide	1956	Inhibition of mycolic acid synthesis (cell wall)	IV/IM	15-20 mg/kg	Gitotoxicity/hepatitis/dizziness
PAS	1946	Inhibition of folic acid	P Os/IV	15-20 mg/kg	GI toxicity, fever, rash
Cycloserine	1952	Inhibition of peptidoglycan	P Os	15-20 mg/kg	Dizziness, depression, CNS

		synthesis			
Ciprofloxacin	1986	Inhibition of DNA gyrase	P Os/IV	750-1550 mg/d	GI toxicity, CNS, tendon rupture
Ofloxacin	1995	Inhibition of DNA gyrase	P Os/IV	600-800 mg/day	GI toxicity, CNS, tendon rupture
Levofloxacin	1996	Inhibition of DNA gyrase	P Os/IV	500 mg/d	GI toxicity, CNS, tendon rupture
Moxifloxacin	1999	Inhibition of DNA gyrase	P Os/IV	400 mg/d	GI toxicity, CNS, tendon rupture
Gatifloxacin	1999	Inhibition of DNA gyrase	P Os/IV	400 mg/d	GI toxicity, CNS, dysglycemia
Clofazimine	1954	Binding to mycobacterial DNA and mRNA	P Os/IV	100-300 mg/d	GI toxicity, cutaneous, ocular discoloration/ pigmentation QT prolongation, dizziness

IV. LIMITATIONS AND DIFFICULTIES TO OPTIMAL USE OF CURRENT THERAPY

As noted over, the principal noteworthy obstacle to the effective treatment of TB with current medications is the length and many-sided quality of the treatment conventions, which adversely affect tolerant adherence and assume a critical part in the rise of medication safe TB. At the point when conveyed under an entirely directed program, the cure rates with the standard regimen are very high, surpassing 90% [52-53]. The World Health Organization has advanced a program known as Directly Observed Treatment – Short course (DOTS), which incorporates coordinate perception via prepared faculty of the utilization of the TB medicines. This has ended up being a standout amongst the most costeffective worldwide wellbeing intercessions accessible today [54] yet its level of execution fluctuates as it is very requesting for patients and for human services staff. In the present situation, because of the rise of multi medication safe tuberculosis (MDR-TB) and relationship amongst HIV and TB, DOTS is turning out to be quickly incapable in controlling tuberculosis. Late reports demonstrate that, regions where there is a high occurrence of MDR-TB, DOTS is neglecting to control the sickness [55]. Treatment of MDR TB must depend on second line drugs which are not so much powerful but rather more harmful than first line treatment, and in addition up to 110-overlay more costly by and large [56-58].

A second noteworthy trouble in the treatment of TB is the high pervasiveness of co-disease with M tb. What's more, the human immunodeficiency infection (HIV). It is evaluated that a large portion of the general population living with HIV/AIDS create dynamic TB [59], around 12 million people are co-contaminated, and approximately 15% of AIDS patients comprehensively bite the dust of TB consistently [60]. These two diseases are synergistic. The danger of movement from idle TB to dynamic malady is assessed to be all things considered fifty crease higher in HIV + people contrasted with HIV - , with the

danger of movement in an individual expanding in extent to the level of cell invulnerable concealment [61-63]. Connections of rifampin, non-nucleoside switch transcriptase inhibitors (NNRTIs) and protease inhibitors (PIs) with cytochrome P450 3A4, make a noteworthy remedial impediment in the treatment of patients co-contaminated with TB and HIV. These drugdrug collaborations render co-treatment with first-line TB drugs and antiretrovirals hazardous in numerous high weight settings. Moreover, hostile to retrovirals and isoniazid can both cause fringe neuropathy, and their poisonous quality is upgraded when utilized together. Along these lines, attending treatment with rifampin and PIs or NNRTIs is not suggested [64-66].

The third major and significant issue of current treatment is that the vast majority of the TB drugs accessible today are insufficient against persevering bacilli, aside from RIF and PZA. RIF is dynamic against both effectively developing and moderate metabolizing non-developing bacilli, though PZA is dynamic against semi-torpid non-developing bacilli [67]. In this way, there is a need to outline new medications that are more dynamic against gradually developing or non-developing steady bacilli to treat the populace at danger of creating dynamic infection through reactivation. Also, it is essential to accomplish an abbreviated treatment timetable to urge patient's consistence and to back off the advancement of medication resistance in mycobacteria.

V. NOVEL WAYS TO RECTIFY THE DIFFICULTIES ARISING DUE TO LATENT TB AND ACTIVE TB

Based Upon Resuscitation Promoting Factors (Rpf): Promising Molecules to Target Latent TB:

The perspective of bacterial lethargy and revival was reformed when the part of Rpf from *Micrococcus luteus* was uncovered by Mukamolova et al. in 1998 [68-70]. In *M. luteus*, picomolar concentrations of Rpf are needed to revive and resuscitate the development of lethargic bacilli^[71-73]. MTB contains five Rpf-like qualities which items, RpfA-E, advance replication and revival of mycobacterial cells [74]. RpfB, one of the five Rpf emitted by TB bacilli, has a critical part in the revival and development incitement of idle MTB. It is likely that this space has organic elements and immunogenicity like that of the full-length Rpf [75]. Think about demonstrate that RpfB is the most cheerful competitor of the five Rpf-like proteins with respect to its immunogenicity and defensive efficacy and these components propose it as a novel subunit immunization for counteractive action of TB [76-77]. Henceforth, the creators chose the RpfB space protein from MTB to test the proposed speculation.

As Rpf is the widely powerful hostile to torpidity elements known as of not long ago [78], the second arrangement of investigates focussed on hunting down mixes with strong against Rpf exercises.

Along these lines, Galina et al. were the first who utilized another class of 2-nitrophenylthiocyanate (NPT) mixes to stifle the enzymatic action of Rpf in vitro. It was shown that an orchestrated group of NPTs significantly repressed growing of contagious spores and have comparable structures to Rpf; thus, they were considered as strong inhibitors of cell divider hydrolases and resulting revival of dormant living beings [79,80].

In this study, Galina et al. presented NPTs as the first case of low-sub-atomic weight intensifies that apply inhibitory impacts on the muralytic exercises of RpfB [79]. As of late described NPT mixes could be utilized as a promising framework for the era of restorative operators to avert reactivation of idle TB [81].

In another study, Fan et al. created monoclonal antibodies against the MTB RpfB area in mice. They effectively delivered three specific and powerful monoclonal antibodies (MAbs) against the RpfB area that stifle the advancing impact of the RpfB space on the development of MTB H37Ra strain and *M. luteus*, recommending that MAbs created against the RpfB area may have the capacity to stifle the reactivation of inactive MTB in vivo [75]. In this study, Fan et al. delivered MAbs as opposed to substance mixes to repress the movement of RpfB.

In spite of the fact that the above methodologies take out utilizing poisonous terrible anti-toxin administrations, the fundamental concern, which is the initiation of the quiet abundance of idle TB and the danger of reactivation (security issue), still remains. These methodologies are constrained to in vitro/in vivo tests under lab conditions and in view of their wellbeing issue none meet their clinical trial stage. Besides, these methodologies are just material on account of patients with confirmed TB; while such patients get immunosuppressive medications; these conditions put them at genuine danger of reactivation of inactive TB. Then again, the substantial number of cases with undiscovered TB will be remembered fondly. These impediments push forward how to build up an approach that could destroy inactive TB instead of disregard it; subsequently, we pondered the improvement of an invert approach with the most noteworthy benefits for the patients. The principle preferences of the proposed approach over different methodologies are appeared in Table no: 5

Table 5: Comparison between the features of proposed approach with the previous ones

Method	Antibiotic therapy	Inhibitors of latent TB	RPFs+ antibiotic therapy
Features			
Require toxic doses	+	+	—
Kill active bacilli	+	+	+
Kill dormant bacilli	—	—	+
Emergence of recurrent TB	+	+	—
Developing resistant forms	+	+	—
Capable to eradicate latent TB	—	—	+
Low doses of drug required	—	—	+
Safety(no reactivation of disease)	—	—	+
Easy and fast process for drug development	—	—	+
Short length of treatment	—	—	+
Require permanent use of drug	+	+	—
Cost effective	—	—	+

VI. THE IDEA OF HYPOTHESIS FOR ACTIVATION OF LATENT TB

As examined some time recently, among the present methodologies to maintain a strategic distance from repeat of TB, all focus on killing elements that are in charge of enactment of inert TB. Rather than past methodologies, which endeavor to hinder initiation of Rpf, researcher propose the switch approach? His underscore the enactment of torpid bacilli inside a defined time after the organization of a standard anti-infection administration for TB. Initiation of Rpf will execute all TB collections thus will annihilate any repeat of TB in the treated subjects and will bring down significantly the requirement for long haul costly and lethal administrations in safe structures. The fundamental thought of our theory is portrayed in figure no. 1

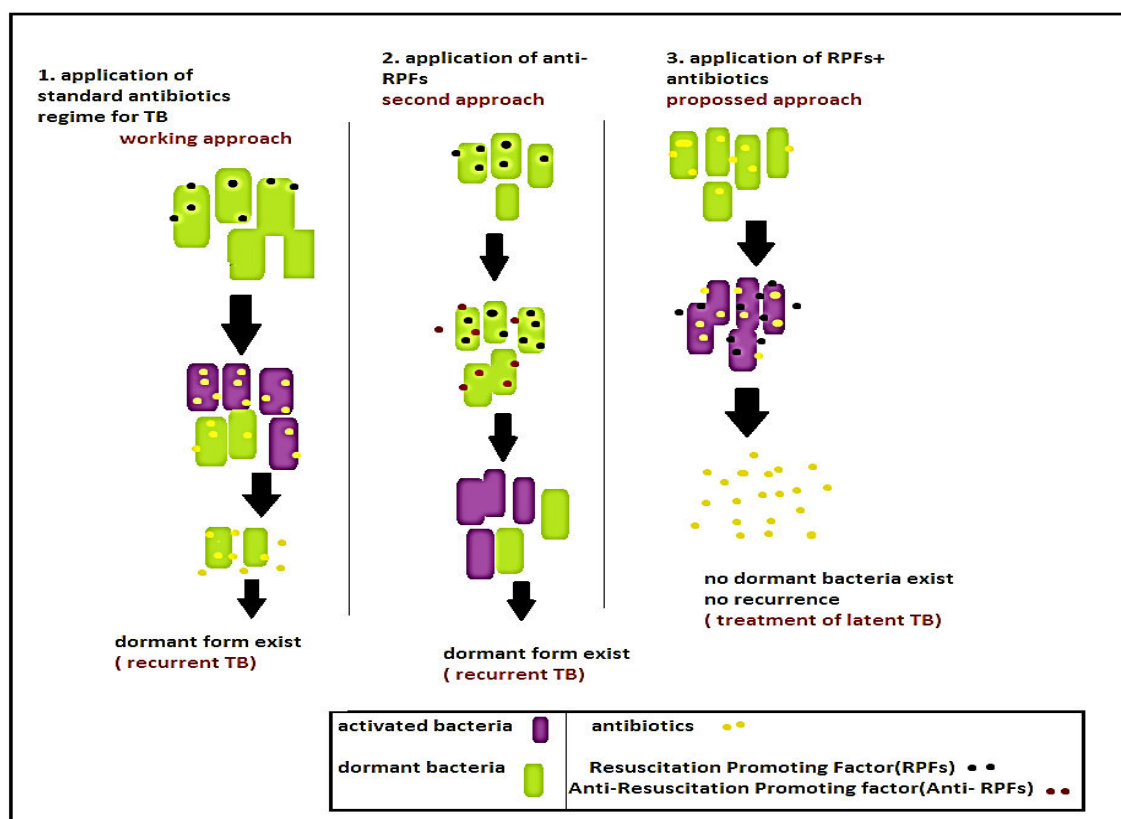


Figure no: 1 Comparison of Current methodologies with researcher proposed approach for destruction of inactive TB.

TB without treatment: In such condition without organization of hostile to TB medications or inhibitors of RPF there is rehased times of inert type of bacilli (asymptomatic period of malady) and dynamic type of bacilli (Symptomatic and intense period of sickness). Organization of standard TB anti-microbials can execute all dynamic type of bacilli yet neglect to dispense with the idle ones. So the repetitive type of TB happens as an aftereffect of initiation of lethargic bacilli. (2) Current methodologies in light of hushing dormant TB by deactivation of Rpf. In this approach the lethargic condition of bacilli will be built up by utilizing inhibitors of Rpf or other incorporated compound against alternate components required in revival of idle bacilli. This approach requires a lasting measurement of inhibitors and the danger of reactivation of dormant TB still remain. (3) Researcher proposed approach

in light of enactment of RPFs: This strategy exploits change of torpid bacilli into initiated bacilli by RPFs. While initiated type of bacilli are helpless to anti-microbials, so the high serum convergence of hostile to TB medications will wipe out recently actuated bacilli. Therefore this approach is skilled to dispose of both dynamic and torpid type of TB.

VII. EVALUATION OF THE HYPOTHESIS

A few mouse models have been produced for concentrating on inert TB [82,83]. In such manner, we propose generally safe mouse strains, (for example, C57BL/6) in which the resistant framework controls the development of bacilli and gives a dependable idle model of TB [82]. As investigated in reference 41, it takes around 1 month to build up an idle mouse model of TB. After this progression, 20 dormant TB mouse models will be separated in two equivalent gatherings as the control and exploratory gatherings. Both gatherings will get similar dosage and administration of anti-infection agents (e.g., isoniazid, rifampicin, pyrazinamide and ethambutol). Following 1 month when the serum level of anti-infection agents would achieve the most extreme fixation, the test gathering will get a solitary measurement of picomolar centralizations of RpfB area protein through an inward breath chamber while in the meantime the anti-microbial treatment will be proceeded for both gatherings for an additional 2 weeks to guarantee the steady high serum level of anti-microbials. Following 2 weeks, both control and test mice will be scarified and their lungs will be refined to distinguish MTB bacilli. As indicated by our speculation, it is anticipated that control mice that got just anti-microbials will be certain for the nearness of TB bacilli. Be that as it may, in test mice we expect a negative result since all lethargic bacilli are enacted by organization of Rpf and therefore murdered by presentation to abnormal state of anti-toxins; consequently, the lung culture of treated mice ought to be TB negative.

VIII. DISCUSSION AND CONCLUSION

TB still is a genuine worry to human wellbeing influencing countless all through the world. As opposed to the available medications connected for the treatment of TB, the long chemotherapeutic regimens as often as possible contribute towards the safe and intermittent structures and this even requires harmful dosages which are not middle of the road by the patients [84-88]. Inertness is an essential normal for TB that empowers the bacilli to make due in granulomatous sores for a considerable length of time and cause MDR and repetitive TB (89-92). Subsequently, procedures rose to target and deactivate the idle frame by creating different mixes against elements which are in charge of the dormant condition of the bacilli as talked about before [93-102]. In spite of the fact that these methodologies appear to be a superior decision over those cases which are impervious to standard anti-toxin administrations, they have real disadvantages as well. They were all directed just under in vitro/in vivo conditions and they have not met creature or clinical trial contemplates. They don't cure inert TB yet they simply shroud the presence of an idle TB. Considering Rpf as the main considerations in charge of revival of lethargic bacilli, utilizing this protein as an intense apparatus against the pathogen itself rose. Our proposed approach and the basic proposed convention to test it in a creature model could undoubtedly

and immediately experience its clinical trial stage in a human populace; and rather than an inward breath chamber, one could without much of a stretch get Rpf through an airborne motivation like that of an asthma quiet. The main worry about this approach is the season of organization of Rpf that will change over all dormant bacilli into actuated structures; however this worry is as of now unraveled by the nearness of high serum level of anti-microbials that are prepared to clear host body of any initiated anti-toxin helpless bacilli. The proposed approach is basic, simple, quick, sheltered and costeffective and as it can focus on the inactive TB it leaves no possibility for the reactivation of inert TB.

IX. FUTURE PERSPECTIVE

In spite of the fact that it was said at the start, it is improbable (if not unfeasible, as a result of the pathophysiology of the infection) that we would ever recognize a solitary specialist that would cure TB. One can surely endeavor, be that as it may, to find new medications with enhanced adequacy and mediocrity and with the capacity to be utilized as a part of new blend treatments to abbreviate the present, extended treatment term. We have to distinguish key TB targets in view of the expanded learning of the pathogen and the physiology of the ailment, to create more intelligent screening tests, and to get ready arrangements of mixes intended to give enhanced leads for antibacterial exercises. The test is that the need is dire however the disclosure and improvement prepare takes an extreme measure of time and assets. The way of the sickness and its geopolitical spread makes it evident that that we have to unite our endeavors even with restricted assets from accessible research finances, the quantity of submitted TB inquire about labs, and the expansiveness of worldwide associations required in TB sedate improvement. In such manner, the late move by major multinational pharmaceutical organizations to effectively participate in the battle against TB is extremely promising. And, after its all said and done, we will in any case require enhanced systems whereby newfound, basic biochemical TB targets can be all the more routinely questioned for the medication revelation purposes. Since a large portion of the essential disclosure is required to be done at scholarly establishments, we require a powerful procedure that makes an interpretation of fundamental TB science into medication revelation work on, including the advancement of measures, the gathering and/or outline of chemicals, HTS, hit-to-lead and lead improvement therapeutic science exercises. The worldwide TB people group must achieve an agreement on the foundation of a strong medication improvement instrument, which can then turn into the standard for what's to come. For this we have to formalize the discourse among scholarly establishments, biotechnology organizations, pharmaceutical organizations and philanthropic associations. As specified before, the foreseen long advancement period for every mix treatment can on a fundamental level be decreased through the CPTR activity.

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Developing Problem Solving Ability In Physics Through Information Processing Approach

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Academic Achievement, Information Processing Approach, Subject Content Mastery, Solving Physics Problems, Pretest, Progressive Tests & Post-Test.

B. Saminathan

Assistant Professor,
Department of Education, CDE,
Bharathidasan University,
Trichy -Tamil nadu (India)

Abstract

Developing problem solving skills leads to improvement in academic achievement. It gives learners necessary confidence to face their day-to-day problems. Training in problem solving skills requires a carefully planned classroom procedure. Since skills, training goes hand in hand with mastery of subject content, the teacher needs to carefully plan out how to teach and what to teach. The learners ought to know the exact strategy used, its significance and how to employ, monitor and evaluate the strategy. It is equally important for them to know how and when these strategies can be transferred to new situations. In these lines, the investigator conducted a study on problem solving ability through Information Processing Approach. For this purpose, he selected the N.M. Govt Hr Sec School, Thirupathur, Sivaganga district. The investigator attempted to develop an Information Processing Approach Model to improve the problem solving ability of the students. The statistical analysis of data revealed the effectiveness of this model on enhancing the problem solving ability in doing physics problems. The major findings are the Information Processing Approach Model significantly enhances the problem solving ability of the students.

I. INTRODUCTION

Developing problem solving abilities in students is one of the primary aims of physics teaching. So proper training should be given to the students to improve their problem solving skills. But the reality is that though they are well versed in the concepts of Physics, they are not able to apply them suitably to new problematic situations. Training in problem solving skills requires a carefully planned classroom procedure. Learning must be truly interactive with the teacher providing an elderly perspective through individualized

attention to learners. Since skills, Training goes hand in hand with mastery of subject content, the teacher needs to carefully plan out how to teach and what to teach. This training must make the information processes and their instructions explicit to the learners. The learners ought to know the exact strategy used, its significance and how to employ, monitor and evaluate the strategy. It is equally important for them to know how and when these strategies can be transferred to new situations. But in practice the students are exposed to very few problems and they are not taught about the Strategies to be followed to solve any type of problems. It does not develop Problem Solving ability among the learners.

II. NEED FOR THE STUDY

The Education commission (1964-66) emphasized the understanding of basic principles, in order to develop problem solving analytical skills and the ability to apply them to new problems. Developing problem solving skills leads to improvement in academic achievement. It gives learners necessary confidence to face their day-to-day problems. If one wants to succeed in all India competitive examinations. IIT entrance, UGC, GATE etc., he must develop his problem solving abilities. But even learners well-versed in concepts, are not able to apply them to new problem situations.

Though a few studies have been made in this direction, a concrete method to improve the problem solving ability among students has not yet been evolved. After careful review of the studies the investigator learned that an optimum level of Information Processing enhances the problem solving ability of the students. It is clear that the existing methodologies are not enough to overcome all these deficiencies and improve the intellectual and problem solving abilities at all levels of education. Hence the investigator attempted this study.

III. SCOPE OF THE STUDY

The advancement of Science and Technology has caused drastic changes in the lives and habits of most of mankind during the last 50 years. But men's ways of thought are not yet accustomed to this change. Many have expected science to find answers to all life's problems. The aim of this study is to help the students to develop their problem solving abilities. This study will throw light on the Information processing approach to problem solving skills. As proposed by the National Policy on Education (1986) there is urgent need to modify curricula and methodologies of learning through appropriate research and development to incorporate elements of problem solving, creativity and relevance. This study is attempted along these lines.

IV. OBJECTIVES OF THE STUDY

The following are the objectives of the study:

- i) To design and develop the Information Processing Approach Model to enhance the problem solving ability of learners in doing problems in Physics.

- ii) To evaluate the Information Processing Approach Model as a means of enhancing the problem solving ability of learners in doing problems in Physics.
- iii) To find out the effect of the Information Processing Approach Model among students, in solving physics problems.

V. SELECTION OF THE SAMPLE

The N.M. Govt Hr Sec School, Thirupathur, Sivaganga district is selected for this study. In the school selected for the study, there are more than 1300 students studying at different levels. Of them the 11th standard students who had Physics as optional subject alone were taken for investigation. They were 57 selected out of 95 students (other than 20 those selected for pilot study) studying physics as a subject in the XI standard, formed the sample of the study. The investigator has adopted an experimental design for the present investigation.

VI. HYPOTHESES FOR THE STUDY

The following are the hypotheses framed for this study:

1. There is significant difference among the three groups in their mean scores of achievement in Problem solving in the Pretest.
2. There is significant difference among the three groups in their mean scores of achievement in problem solving in the post-test.
3. There is significant difference among the control group students in their mean scores of achievement in problem solving in the pretest, progressive tests and the Post-test.
4. There is significant difference among the experimental group students in their mean scores of achievement in problem solving in the pre test progressive tests and the post test.
5. There is significant difference among the experimental group-II students in their mean scores of achievement test in problem solving in the pre test, progressive tests and the post test.

VII. VARIABLES

The present investigation is an attempt to determine the effectiveness of Information Processing Approach Model in promoting the problem solving ability in Physics and to estimate the extent of relationship between selected variables in the most effective Information Processing Approach Model.

- a) The Information Processing Approach is the independent variable in this study.
- b) The problem solving ability in doing physics problems is dependent variable.
- c) Control of extraneous variables:
 - i.) Gender - study is conducted only with female students.
 - ii.) Location - Investigation is carried out in the same class room situation in the same school.
 - iii.) Maturation -Investigation is carried out within the duration of 3 months.
 - iv.) Age - Students of the same age group have been chosen (16-17 years).

VIII. EXPERIMENTATION IN PHASES

Phase: I

1. Understanding the technology of Information Processing Approach Model instruction.
2. Developing a systematic model for the application of Information Processing Approach Model instruction in promoting the ability to solve physics problems.
3. Identifying chapters related to appropriate problems for the application of Information Processing Approach Model in the physics text book at eleventh standard level.

Phase: II

4. Trying out the effectiveness of Information Processing Approach Model with a small group of students as pilot study.
5. Evaluating the effectiveness of the Information Processing Approach Model.

Phase: III

6. Conducting pre-test to assess the entry behaviour of the students in the class room.
7. Administering of Anxiety inventory, Achievement motivation inventory, and Home Environment scale- tools to the students.
8. Comparing students based on pre-test achievement scores so as to enable them to be grouped in three equal groups as Experimental - I, Experimental - II and Control groups and establishing the equality of the three groups by mean and standard deviation of achievement scores in pre-test.

Phase: IV

9. Teaching of students of experimental group-I to be taught through Information Processing Approach Model with exposure of the model to the students, experimental group -II to be taught through Information Processing Approach Model without exposure of the model to the students, and control group to be taught through the traditional method of teaching.
10. Duration of the treatment would be of three months.

Phase: V

11. Administering the test after the completion of each level of the Information Processing Approach Model so as to enable the investigator to administer eight progressive tests.
12. Administering the post test after the completion of instructional units.
13. Entering, categorizing and analyzing the pre-test, progressive tests and post-test scores.

IX. SCHEME OF DATA ANALYSIS

In the present study, the relevant data obtained from test scores of 57 students in the pre test, progressive tests and the post test have been analysed as follows:

- **Multiple Regression Analysis**

Multiple Regression Analysis explores the nature of the relations between variables. From this analysis, by using computer program, the co-efficient of variables were calculated and the Information Processing Approach Model was validated by ANOVA.

- **Descriptive Analysis**

This generates information about the nature of a particular group of individuals. Mean and standard deviation were calculated to determine the central tendencies and dispersion of variables.

- **Differential Analysis**

This tool involves determination of statistical significance of difference between groups with reference to selected variables. It involves Kruskal Wallis, non parametric tests, and 't' tests for small samples.

- **Analysis of variance (ANOVA)**

It is a mathematical technique for partitioning the total variation of a set of data in such a manner as to identify the component sources of variation. This technique enables the researcher to test the hypotheses concerning the equality of more than two population means. It involves the collection of 'F' values. In the present study it is used to test whether the difference between means of the Pre-test, 8 Progressive tests, and Post-test are significant.

X. FINDINGS

1. In the Information Processing Approach Model, the weight age of the predictor variables (the steps in the Information Processing Approach Model) are found as:
$$\begin{aligned} b_1 &= 1.561 \text{ (weight at 'teacher initiates')} \\ b_2 &= 0.289 \text{ (weight at 'verification of previous knowledge')} \\ b_3 &= 0.589 \text{ (weight at 'presents the problem')} \\ b_4 &= 1.082 \text{ (weight at 'analysing the variables')} \\ b_5 &= 0.477 \text{ (weight at 'relating the variables')} \\ b_6 &= 0.857 \text{ (weight at 'formulating hypotheses')} \\ b_7 &= 1.652 \text{ (weight at 'testing the hypothesis')} \\ b_8 &= 1.050 \text{ (weight at 'verification of the solution')} \end{aligned}$$
2. There are no differences among the students in the control group, the experimental group I and the experimental group II in their mean scores on home environment, achievement motivation and anxiety.
3. There are no differences among the students in the control group, the experimental group I and the experimental group II students in their mean scores in problem solving in the pre-test.
4. There are no significant differences among the three groups in their mean scores on problem solving in the pre-test.
5. The control group students do not differ in their mean scores in problem solving in the ten progressive tests.
6. There is a continuous gradual steady increase in the mean scores of experimental group I students as they go through the ten progressive tests.
7. There is a continuous gradual steady increase in the mean scores of experimental group II students as they go through the ten progressive tests.

XI. DISCUSSION

- Stravelly Holmer (1993) identified the Information Processing elements as (i) Configurations (ii) Locations (iii) Concentration (iv) Organization (v) Replication (vi) Representation (vii) Recall and (ix) Transformation. Similarly in this study Information Processing Approach Model included eight steps as (i) Teacher initiates (ii) – Verifying the previous knowledge (iii) Presents the problem (iv) Analysing the variables (v) Relating the variables (vi) Formulating hypotheses (vii) Testing the hypothesis and (viii) Verifying the solution. In this study ‘verifying the solution’ gives an effect similar to that of ‘Transformation’ which is one of the elements of Information Processing in Stravelly Holmer’s study. Like that, ‘Analysing the variables’ and ‘Relating the Variables’ are highly related to ‘Organisation’ which is one of the elements of Information Processing in Stravelly Holmer’s study. ‘Identifying the previous knowledge’ gives an effect similar to ‘Location; which is one of the elements of Information Processing in Stravelly Holmer’s study? Like that, ‘Teacher initiates’ needs ‘configuration’ which is one of the elements of Information Processing in Stravelly Holmer’s study.
- Vaidya (1979) identified that, sensing the problem was closely identifiable with plasticity in thought processes, fluency or interest in generating difficult problems. Similarly in this study sensing is the strategy rightly fitted in ‘Presents the Problem’ level in the Information Processing Approach Model and the experimental group I and the experimental group II students performance in problem solving increased considerably on the application of this model.
- Starmack. John. (1991) found that if the student used more analysis and synthesis, it improved his abilities to solve complex problems. Similarly in this study the problem solving ability of the experimental group I and the experimental group II students was enhanced at the ‘analysing the variables’ and ‘relating the variables’ levels of the Information Processing Approach Model,
- Hom Robert. R. (1992) described Information Mapping as a methodology for analysis. Similarly in this study ‘Information mapping’ strategy is rightly fitted in at the ‘Relating the variables’ level in the Information Processing Approach Model and the experimental group I and experimental group II students’ performance in problem solving was enhanced considerably by applying this model.
- Victor R. Oalciose and Christine Harrington (1991) concluded that the overall proactive problem solving-training that required that students monitor their solution processes (MPS group) resulted in better problem solving performance. Similarly in this study, ‘Monitoring the process’ strategy is rightly fitted at ‘testing the hypothesis’ level in the Information Processing Approach Model and the experimental group I and the experimental group II students’ performance in ‘problem solving improved on the application of this model,
- Vaidya (1979) interpreted that a high loading on the scheme of thought relating to testing and verification of hypotheses. In this study ‘Testing the hypothesis’ is rightly identified as a level in the Information Processing Approach Model and the performance of students in

the experimental group I and the experimental group II increased considerably on the application of this model.

- Maria Cardella Elevar (1989) identified that the low mathematics ability students progressed as problem solvers by verifying their solutions. Similarly in this study the problem solving ability of experimental group I and the experimental group" students considerably increased at the 'Verifying the solution' level in the Information Processing Approach Model.
- Allison, Scott, T. (1992) insisted on the need for a strategy for sustaining student attention and systematic Information Processing in college-level class instruction. In this study a systematic behaviour of Information processing was attempted in the classroom situation. And the performance of the experimental groups I, II increased on application of the Information Processing Approach Model.
- In this study the weight age of the steps of the Information Processing Approach Model are found to be (i) Teacher initiates (1.561) (ii) Verifying previous knowledge (0.289) (iii) Presents the problem (0.589) (iv) Analysing the variables (1.082) (v). Relating the variables (0.477) (vi) Formulating hypotheses (0.857) (vii). Testing the hypothesis (1.652) (viii) Verifying the solution (1.050). If the teachers are given proper training by adopting this model according to this weight age, the students' Information Processing should be activated to the optimum level and the problem solving ability also should be enhanced.

XII. EDUCATIONAL IMPLICATIONS OF THE STUDY

The purpose of education is to improve the cognitive abilities of the students. Problem solving enjoys the highest priority in the learning hierarchy. Developing the Problem solving ability is the ultimate aim of education. The investigator attempted to develop an Information Processing Approach Model to improve the problem solving ability of the students. The statistical treatment of data revealed the effectiveness of this model on enhancing the problem solving ability in doing physics problems. The major findings are:

- i. The Information Processing Approach Model significantly enhances the problem solving ability of the students.
- ii. The weightage of the steps in the Information Processing Approach Model has been determined by Multiple Regression Analysis followed by ANOVA and will serve as a useful guide.
- iii. Stepwise improvement of this model is significant in enhancing problem solving ability of the students.

On the basis of the above findings, the investigator suggests the following in order to improve or rather modify the current educational practices.

- i. Teachers should be given proper orientation towards the Information Processing Approach.
- ii. Teachers should be trained to develop Information Processing Approach Models for various disciplines and chapters.

- iii. The results obtained from the study demand that every child be helped to develop basic skills in problem solving so that the child is motivated to seek, work out and solve problems.
- iv. Curriculum planners could pay more attention to improving problem solving ability while constructing syllabus. Problems of various types could be incorporated as exercises in textbooks.
- v. The pattern of question papers should also be revised. More importance should be given to solving problems. At least a few of the problems should be given as compulsory questions. That will motivate better, closer attention to problem solving in teaching / learning.

The present research study "Effect of Information Processing Approach on developing Problem Solving Ability in Physics" reveals that activating appropriate processes through an Information Processing Approach to problem solving plays a vital role in improving learners' problem solving ability. Further it is observed that the Information Processing Approach expands the learning schema, since the learner is able to activate appropriate Information Processing. This contributes to meaningful and joyful learning. This facilitates the teacher's task of enabling the students to apply Information Processing Model in enhancing their own problem solving ability.

XIII. CONCLUSION

The various Education Commission Reports insist on the development of the problem solving ability among students at all levels. Problem solving ability is related not only to Mathematics learning but also to the learning of all other subjects. The subject Physics offers more scope for developing the problem solving skills among the learners. It is necessary to optimize students' Information Processing if they are to emerge as expert problem solvers. So, there is an urgent need to gear up national effort towards the implementation of the Information Processing Approach Model at all levels of education, and in particular at the higher secondary level. It is also imperative to give proper training to the teachers to equip themselves for practicing the Information Processing Approach Model in classrooms. Hence, there is the need to include steps in the implementation of the Information Processing Approach Model in teacher education courses.

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A Study of Scientific Attitude of Secondary School Students in West Tripura District

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Key Words

Scientific Attitude, Cognitive Concept, Mental Habits, Intellectual Honesty, Open Mindedness, Suspended Judgment

1 st	Dr. Y. Chakradhara Singh	Assistant Professor, Faculty of Education, ICFAI University, Tripura
2 nd	C. Arundhathi Bai	Assistant Professor, Faculty of Education, ICFAI University, Tripura

Abstract

Scientific attitude is a cognitive concept and is a composite of a number of mental habits or tendencies to react consistently in certain way to a novel or problematic situation. These habits or tendencies include accuracy, intellectual honesty, open mindedness, suspended judgment, criticalness, and habit of looking for the cause and effect relationships. These habits are important for everyone in everyday life. Scientific attitude is necessary to an individual to lead a smooth and comfortable life in the society. An individual with good scientific attitude can understand the phenomena of nature and human behavior. To develop scientific attitude among students, they should be made to practice and observe science so that they get the opportunity to feel and develop the components of scientific attitude in their minds. In this context "A Study of Scientific Attitude of Secondary School Students in West Tripura District" was conducted to measure scientific attitude. For this purpose Descriptive survey method of research was used. A sample of 110 secondary school students were selected randomly from seven schools located in West Tripura district. The methodology includes 't' test.

I. INTRODUCTION

Science has its significant role in promoting quality of life either directly or indirectly. Science not only satisfies the usual needs for its inclusion as a subject in the curriculum – such as intellectual, cultural, moral, aesthetic, utilitarian as well as vocational values, science learning provides training in scientific method and also helps to develop a scientific

attitude of mind in the learner. The acquisition of the knowledge of scientific terms, principles and concepts, a clear understanding of them, the ability to use such knowledge in different situations in the life and in the development of skills should be the outcomes of teaching and learning of science. Moreover, the students should develop a proper attitude towards the study of science, besides appreciating the importance of science in human life and civilization. It also helps to improve their abilities and capacities in science.

Scientific attitude is the most important outcome of science teaching. The scientific attitude is really a composite of a number of mental habits or of tendencies to react consistently in certain ways to a novel or problematic situations. These habits or tendencies include accuracy, intellectual honesty, open-mindedness, suspended judgment, criticalness and a habit of looking for the cause and effect relationship. It is a cognitive concept. Scientific attitude is also a complex behavioural aspect of science having so many characteristics and it can be attributed to many situations. Scientific attitudes are normally associated with the mental process of scientists. These habits are important in the everyday life and thinking not only for the scientist but for everyone.

To develop scientific attitude, the teachers should always remember that without a questioning mind and a spirit of enquiry, studies in science will only mean acceptance of dogma and will never lead to development of scientific attitude in the learners. The students should be made to practice and observe science so that they get the opportunity to feel and develop the components of scientific attitude in their minds. Hence there is a felt need to study scientific attitude of secondary school students. The present work, "A Study of Scientific Attitude of Secondary School Students in West Tripura District" was intended to measure scientific attitude.

The Scientific Attitude Scale consists of six dimensions: rationality, curiosity, open-mindedness, aversion to superstitions, objectivity of intellectual beliefs and suspended judgment. They are as follows:

1: Rationality

- (a) Commitment of the value of rationality.
- (b) Tendency to test traditional beliefs.
- (c) Seeking for natural cause of events and identification of cause and affect relationship.
- (d) Acceptance of criticalness.
- (e) Challenge of authority.

2 : Curiosity

- (a) Desire for understanding new situations that are not explained by the existing body of knowledge.
- (b) Seeking to find out the 'why' and 'how' of observed phenomena.
- (c) Giving emphasis on the question in approach for novel situation.
- (d) Desire for completeness of knowledge.

3 : Open-mindedness

- (a) Willingness to revise opinions and conclusions.
- (b) Desire for new things and ideas.

(c) Rejection of singular and rigid approach to people, things and ideas.

4 : Aversion to superstitions

- (a) Rejection of superstitions and false beliefs.
- (b) Acceptance of scientific facts and explanation.

5: Objectivity of Intellectual Beliefs

- (a) Demonstration of the greatest possible concern for observing and recording facts without any influence of personal pride, bias or ambition.
- (b) Not allowing any change in interpreting results on the basis of present social, economic or political influences.

6 : Suspended judgment

- (a) Unwillingness to draw inferences before evidence is collected.
- (b) Unwillingness to accept facts that are not supported by the convincing proof.
- (c) Avoidance of quick judgment.

II. OBJECTIVES OF THE STUDY

- 1.To find out the level of scientific attitude possessed by the secondary school students.
- 2.To find out the influence of following variables on scientific attitude of secondary school Students.
 - a) Gender b) Type of school c) Residence d) Medium of instruction

III. HYPOTHESIS

1. There is no significant difference in scientific attitude of boys and girls of secondary schools.
2. There is no significant difference in scientific attitude of private and government secondary school students.
3. There is no significant difference in scientific attitude of urban and rural secondary school students.
4. There is no significant difference in scientific attitude of Bengali medium and English medium secondary school students.

IV. DESIGN AND METHODOLOGY

Descriptive survey method of research was employed for the present study. A sample of 110 students of IX standard was selected randomly from seven schools of West Tripura District. Sample was collected from government, and private schools consisting of boys and girls of rural and urban areas.

4.1. Sample Design

Table 1: Sample Design

Sl No:	Name of the School	No. of Students	
		Boys	Girls
1	Berimura Higher Secondary School	7	7
2	Lembucherra High School	8	6

3	Fatikcherra High School	8	7
4	Mohanpur High School	9	8
5	Sri Krishna Mission School	9	8
6	Bhavans Tripura Vidya Mandir	8	9
7	Pranavananda Vidya Mandir	8	8

4.2.Tools

Among the tools developed in India, the Scientific Attitude Scale developed by J.K. Sood and R.P.Sandhya was finalized for the final administration to measure the scientific attitude of secondary school students. Scientific Attitude Scale contained 36 statements of which 18 were of positive polarity and 18 were of negative polarity. The distribution of items was as follows:

Table 2: Distribution of items

Dimension	Negative Polarity (Item Numbers)	Positive Polarity (Item Numbers)
1. Rationality	1,2,6	3,4,5
2. Curiosity	8,9	7,10,11,12
3. Open-Mindedness	13,14	15,16,17,18
4. Aversion to superstitions	19,21,24	20,22,23
5. Objectivity of intellectual beliefs	25,26,28,30	27,29
6. Suspended judgment	31,32,34,35	33,36

4.3 Statistical Analysis

The data was analyzed using 't' test.

V. ANALYSIS AND INTERPRETATION

5.1 To study scientific attitude possessed by the Secondary school students.

Table-3: Level of Scientific Attitude possessed by the Whole Sample.

Sample size	Mean	Standard deviation
110	126.85	15.402

It is clear from the table-3, that the students studying in secondary schools hold average level of scientific attitude. In the sample, as per the standard deviation, there is a little bit of higher dispersion of scores in the units of the sample.

Hypothesis-1: There is no significant difference in scientific attitude of boys and girls of secondary schools.

Table- 4: Comparison of Scientific Attitude in Boys and Girls

S.No	Category	N	Mean	S.D	't'Value
1.	Boys	57	124.65	16.07	1.56 ^{NS}
2.	Girls	53	129.21	14.43	

P at 0.01 level is 2.58

Not significant at 0.01 level

As per the critical ratio value of the above table, it is clear that there is no significant difference between the levels of scientific attitude possessed by boys and girls. The difference is not significant as the obtained 't' value (1.56) is less than 't' table value (2.58) at 0.01 level of significance. Both the boys and girls are with average scientific attitude.

Hypothesis-2: There is no significant difference in scientific attitude of private and government secondary school students.

Table- 5: Comparison of Scientific Attitude in the Students of Private and Government Schools

S.No	Category	N	Mean	S.D	't'Value
1.	Private	50	133.74	15.82	4.58 ^{\$}
2.	Govt	60	121.1	12.52	

\$ Significant at 0.01 level

According to the above table-5, there is a significant difference in the level of scientific attitude possessed by the students studying in private and government schools. The difference is significant as the obtained 't' value (4.58) is more than 't' table value (2.58) at 0.01 level of significance. The students studying in private schools are relatively better in holding scientific attitude than those of government schools.

Hypothesis- 3: There is no significant difference in scientific attitude of urban and rural secondary school students.

A comparison is made to identify the difference in the possession of scientific attitude by the students residing in urban and rural areas. The results are as follows.

Table – 6: Comparison of Scientific Attitude in the Students of Urban and Rural Schools

S.No	Category	N	Mean	S.D	't'Value
1.	Rural	43	122	12.23	2.91 ^{\$}
2.	Urban	67	129.96	16.47	

\$ Significant at 0.01 level

As per the critical ratio value, from the given table-6, there is significant difference in the level of scientific attitude possessed by the students of rural and urban secondary schools. It can be seen that the students of urban secondary schools hold slightly high scientific attitude than rural secondary schools.

Hypothesis- 4: There is no significant difference in scientific attitude of Bengali medium and English medium secondary school students.

Table -7: Comparison of Scientific Attitude in the Students of Bengali Medium and English Medium Schools

S.No	Category	N	Mean	S.D	't'Value
1.	Bengali	60	121.1	12.52	4.58 ^{\$}
2.	English	50	133.74	15.82	

\$ Significant at 0.01 level

From the above table-5, it is clear that there is significant difference between the level of scientific attitude possessed by the students studying in Bengali medium and English medium schools. The students studying in English medium schools are relatively better in holding scientific attitude than those of Bengali medium schools.

VI. FINDINGS

From the present study it is observed that the students studying in secondary schools hold an average level of scientific attitude. No significant difference is found between the levels of scientific attitude possessed by boys and girls. But the variables-Residence, Medium of Instruction and Type of school had significant difference in the level of scientific Attitude, and thus hypothesis is rejected. It can be seen that the students of urban secondary schools and English medium schools hold slightly high scientific attitude than those of rural secondary schools and Bengali medium schools.

VII. SUGGESTIONS

Based on the findings of the study some suggestions are worth mentioning. One of the major aims of teaching science is invariably the development of scientific attitude in the student. Some of the factors like: providing proper atmosphere in the class, proper use of practical class, well-equipped science labs with proper facilities, engaging in wide reading in general science, utilizing science library properly, reading paper cuttings from news papers, good textbooks, co-curricular activities in science such as making scientific models, organizing science clubs, discarding superstitious beliefs from students by teaching science lessons practically and stressing the need to collect evidences before arriving at some conclusion, etc. influence in development of scientific attitude among students. All these are helpful and can be implemented practically to promote the scientific attitude among the students. Science teachers must try to promote scientific attitude in the students through some procedures like taking students to science exhibitions, fairs, excursions, fieldtrips, industries, etc. Due steps must be taken by the government especially in rural areas for the development of students. It is also seen that the changes in science and technology are accessible to everybody at any time everywhere. So, special focus must be given by the teachers to promote scientific attitude in students. There is a need to develop the facilities to

promote quality in science instruction to develop scientific attitude along with the medium of instruction.

VIII. SUGGESTIONS FOR FURTHER RESEARCH

Based on the present study, a good number of new areas can be studied by the future researchers. The areas and variables which are not covered by this study may be put to test to enlighten the factors associated with inculcation and development of scientific attitude and other factors associated with achievement in science. Critical observations can also be taken up at different levels, to identify the factors that influence scientific attitude, students studying in state and central schools, to identify the influence of educated and uneducated parents on the scientific attitude etc.

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Mindmaps – The Visual Tool Promotes Active Learning of Science Concepts among High School Students

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1 st	Dr. K. R. Rajenran	Graduate Assistant, GHS School, Malaipatti, Tamil Nadu
2 nd	A. Selvaraj	Ph.D scholar, Dravidian University, Kuppam (A. P.)
3 rd	Dr. S. Rajaguru	Associate Professor Department of Education, SRKV college of Education, Coimbatore
4 th	G. Kalaiselvi	Assistant Professor, Ramana college of Education, Aruppukottai

Abstract

Education is the life long process of acquiring new knowledge and skills through both formal and informal exposure to information, ideas and experience. The purpose of education is to bring out hidden potentialities in human beings. It is a product of experience and universally acknowledged that any attempt to improve the quality of education ultimately depends on the quality of instruction imparted in the class room instruction. It is based on traditional methods which have become outmoded in the present modern world. No considerable change has been made in these instructional methods with the passage of time. Our population growth and manpower requirements have necessitated revolutionary changes in our educational system and teaching methods. If we improve the quality of education, to cope up with the challenges in education, we should pay proper attention for changing the strategy of instruction and efforts should be made to introduce new methods and evolve new techniques. Hence efforts towards providing appropriate teaching approaches suggested that yield many interesting insights and possibilities within the circumstances. Science occupies a major part of school curriculum. It is required for all pupils. In the event of teaching science effectively in our schools, our nation will be upgraded. The whole edifice of future India resets on the proper teaching of science.

I. INTRODUCTION

In general science teaching is concerned with

- Making pupils reason about things they have observed and to develop their power of weighing and interpreting evidence.
- Acquainting pupils with the broad outside of great scientific principles and with the ways in which these are exemplified in familiar phenomena and applied in the service of mankind.

The effectiveness of teaching depends upon the method that the teacher adopts. In order to improve the teaching effectiveness, the teacher must acquire knowledge about different types of methods of teaching science is very much essential. The teacher is however, free to choose any method that he/she thinks is suited to the children.

II. STATEMENT OF THE PROBLEM

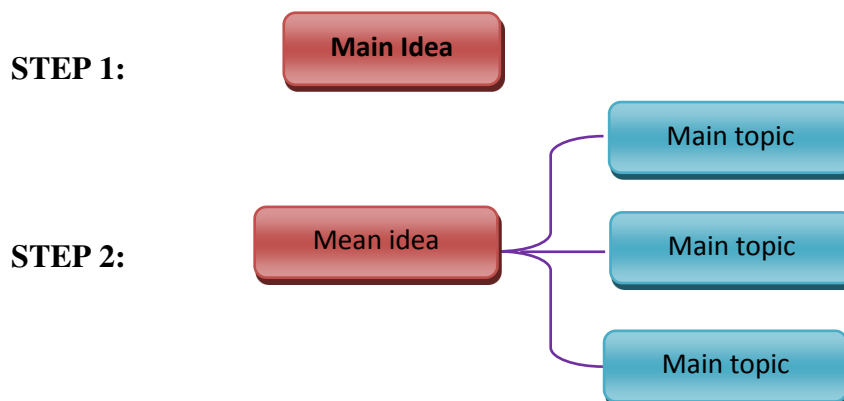
To identify the effective method of teaching for children in learning Science concepts, the investigator has taken up the research problem “**Mindmaps – The Visual Tool Promotes Active Learning of Science Concepts among High School Students**”. This study attempts to compare the performance of achievement among children in learning Science concepts who learnt through MindMaps used Active Learning Method (ALM) and Conventional Teaching (CT) strategies.

2.1 Mind maps:

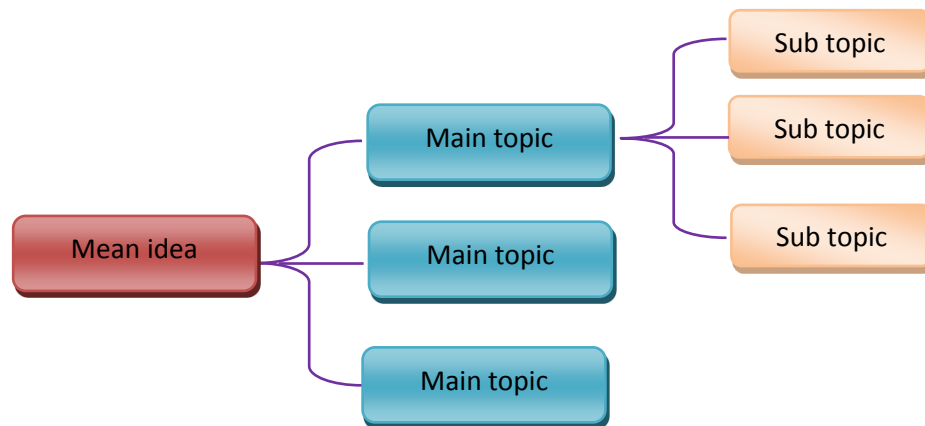
Tony Buzan a well known British Psychologists known for the creation and conceptualization of the technique called Mind maps. A mind map is a diagrammatic representation of any idea or concept and the various points and ideas thought surround the central theme. Intact since the mind also stores information in a visual manner. A Mind map can be said to be visual representation of the thoughts and ideas in the mind. It is a simple but brilliant manner in which you can create what you are thinking about on paper so that you can refer to it and consciously think about it and even share it effectively with other people for feedback.

2.2 How to make a mind map:

You start a mind map at the center, with a main Idea. All the information you add from this point on should relate to this main idea so it helps you stay focused.



STEP 3:



- Then you can just start entering ideas (main topics) that come to you when you think of the main idea. You can just enter them on them down in the order they come to you.
- Once you have a lot of ideas written down, then you can start grouping them into a logical structure. If you are using pen and paper it will be easier to create a new map, organizing ideas you come up with. If you are using a computer just drag and drop the main topics to where you want them. .
- Now you can go one step further, and break down each idea into its component parts (Sub topics). This might involve the entering information you've found, or ideas that they have occurred to you.
- Unlike most writing processes, mind map supports even encourage, nonlinear thinking. It allows the map maker to move around, to follow their interests. But it does all of this within an organized frame work.

A mind map is a way of organizing a set of ideas using radiant thinking which is rational and artistic, organized and creative, like a tree. It typically created on large sheet of paper using multiple colours and a combination of words and drawings that stimulate the visual abilities of the mind and enhance memory. A mind map can be used to take notes, develop a concept, or develop an overview of an activity. Mind mapping is a good tool for brain stroming, because it allows you to capture information as it is generated without trying to force into categories. It also creates a picture of the relationships among ideas.

2.3 Value of mind mapping:

One of the big things about Mind mapping is its flexibility to be used in a wide range of settings. Users can use Mind mapping for that purpose:

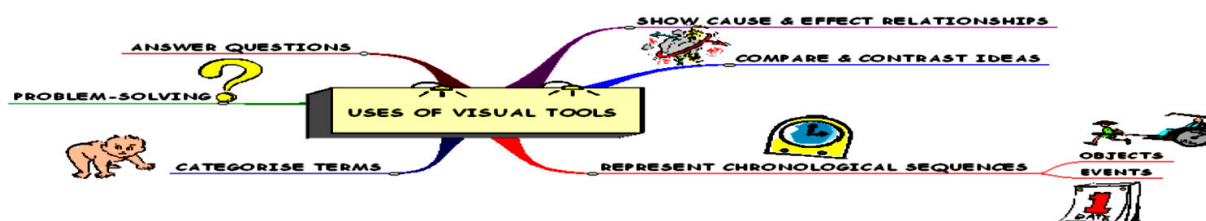
- To do lists
- Presentations
- Note taking
- Problem solving
- Project planning
- Decision making
- Knowledge management
- Project management

- Creative thinking
- Writing
- Strategic planning
- Group brainstorming
- Goal setting
- Training/ education
- Business process mapping
- Event planning
- Research
- SWOT .analysis

Mind maps facilitate memory. Memory is naturally associative, non linear. Any idea probably has thousand of links in your mind. Mind maps allow associations and links to be recorded and reinforced. It provides a way of relating to the world in which one lives in a more meaningful way. A mind map is a tool for making sense out of things and for realizing one's priorities.

2.4 Visual Tools and Pupils' Learning

Today Mind Mapping is widely used in the academic and corporate worlds. Teachers and students use a wide range of visual learning formats in the classroom for a variety of purposes. At one time referred to as graphic organizers, visual tools is a term that has recently been adopted to reflect a broader conception of what constitutes graphic representations and their uses. In using Mind Mapping, the author adopted the guidelines for creating Mind Maps as outlined by the creator of the scheme, Tony Buzan, and updated by Ian Harris and Oliver Caviglioli Visual tools include a wide range of graphic representations, such as concept maps, matrix diagrams, cross sections, time lines, fishbone diagrams, pie charts, and writing frames. Often collectively described as graphic organisers, many of these diverse tools, according to Merkle and Jefferies, stemmed from the research of David Ausubel in using advanced organisers or introductory prose passages to help learners to acquire new knowledge and improve their literacy skills^{vii}. Over time, advanced organisers became known as structured overviews, to account for visual displays of information that were used not only at the beginning of classroom interactions, but also during, and towards the end, of lessons^{viii}. Eventually, “graphic organiser” replaced “structured overview” as the favoured term of usage. After this, “visual tools” was the term adopted to reflect a wider view of graphic representations and their purposes^{ix}. Visual tools have been applied in a variety of ways to enhance learning and teaching. Readance *et al*^x, argue that they can be used as in Figure 1:



Some of visual tools available to teachers and students, little systematic study have been carried out to determine their effectiveness and their role in teaching and learning^{xii}. In the context of science education, Mind Maps in structure and function, their use of a visual format to illustrate and develop thinking, and their use of spatial organisation to represent hierarchies of concepts. The evidence exists to describe how to effectively use mapping to enhance learning and teaching.

III. OBJECTIVES OF THE STUDY

In this study, the investigator has framed objectives for children in learning Science concepts at High school level. To develop instructional strategy named Active Learning Method (ALM) for children in learning Science concepts at high school level using Mindmaps.

1. To study the significant difference if any in the achievement of children learnt science concepts through different instructional strategies such as ALM using mind maps and Conventional teaching method (CT).
2. To study the influence of the background variables (Gender, Parents Educational Qualification, Family income, Family size and Intelligence) on the achievement of children in learning Science concepts taught through two different instructional strategies such as ALM using mind maps and CT.

IV. HYPOTHESES OF THE STUDY

In this study the investigator deals with the effectiveness of Mindmaps on the achievement of children in learning science at high school level. He has framed hypotheses for this study as follows:

- 1) There will not be significant difference in the Post test achievement of students in learning Science concepts learnt through two different instructional strategies (ALM using mind maps and CT).
- 2) There will not be significant difference in the Retention test achievement of students in learning Science concepts learnt through two different instructional strategies (ALM using mind maps, and CT).
- 3) There will not be significant difference in the Post test achievement of students in learning Science concepts through ALM using mind maps with regards to their background variables (Gender, PEQ, FI, FS and IQ).
- 4) There will not be significant difference in the Retention test achievement of students in learning Science concepts through ALM using mind maps with regards to their background variables (Sex, PEQ, FI, FS and IQ).
- 5) There will not be significant difference in the Post test achievement of students in learning Science concepts through CT with regards to their background variables (Sex, PEQ, FI, FS and IQ).

- 6) There will not be significant difference in the Retention test achievement of students in learning Science concepts through CT with regards to their background variables (Sex, PEQ, FI, FS, and IQ).

V. SAMPLE OF THE STUDY

The sample consists of 82 children in learning science concepts. The investigator purposively selected a Government Higher Secondary School at Malaipatti in Viruthunagar District of Tamilnadu State for the present study. Among them 21 were boys and 20 girls. To select these children the investigator used Purposive Sampling Technique.

VI. TOOLS USED IN THE STUDY

The following tools were used in the study for data collection

- a). Proforma
- b). Achievement test

The achievement test in science developed by the investigator this test consists of 25 objective type questions. The reliability and validity of the test are tested with eminent scholars this test paper was used for pre - test, post test and Retention test.

VII. EXPERIMENTAL DESIGN

The study proposed to inquire in to the effectiveness of two methods of instruction, i.e. cooperative learning approaches and conventional method of teaching administered to the controlled and experimental group of children. The equated group design has been selected for the study. The dependent variable of this experiment is retention of information gained by children, learnt through different methods of instruction. One is active learning approach using Mindmaps and the other is conventional method of teaching. 82 children (42 boys and 40 girls) of standard IX were identified and administered a pre-test on the previous knowledge about the content which was selected for treatment. The pretest score and the other information about sex, family income, parent's education, socio-economic status and the family size of children were referred for splitting the 82 children in to two equated groups, as each group contains 21 boys and 20 girls. One group was treated with active learning approach using Mindmaps and another group was treated with conventional method of teaching. An achievement test was conducted for both the groups, immediately after the treatments such as active leaving approach and Conventional method of teaching. This test termed as Post-test. The same achievement test was administered after one month known as the retention test.

Table -1: Difference between Control and Experimental Group in Post Test

Groups	N	Mean	SD	Mean Difference	SE	Calculated "t" Value
Control	41	15.85	3.19	1.56	0.74	2.099 **
Experimental	41	17.41	3.53			

****Significant at 0.01 level.**

From the table it is found that there is a significant difference between the means of control and experimental group with regards to their post-test scores. The mean difference is significant at 0.01 levels. Hence, the hypothesis "There is no significant difference in the

post-test performance of children in learning science concepts through conventional and active learning method using Mindmaps is rejected. It is concluded that the children those who learned science concepts through active learning method using Mindmaps scored more than conventional method of teaching group

Table-2: Difference between Control and Experimental group in Retention Test

Groups	N	Mean	SD	Mean Difference	SE	Calculated "t" Value
Control	41	12.34	3.26	1.86	0.757	2.456 **
Experimental	41	14.2	3.59			

****Significant at 0.01 level.**

From the table it is found that there is a significant difference between the means of control and experimental group with regards to their retention scores. The mean differences is significant at 0.01 level. Hence, the hypothesis "There is no significant difference in the Retention ability of children in learning science concepts through conventional and active learning method using Mindmaps" is rejected. It is concluded that the children those who learned science concepts through active learning method using Mindmaps have more Retention ability than conventional method of teaching group.

VIII. EXPERIMENTAL GROUP WITH BACKGROUND VARIABLES

Table-3: Difference between Boys and Girls of Experimental Group in Retention Test

Groups	N	Mean	SD	Mean Difference	SE	Calculated "t" value
Boys	21	13.95	3.387	0.5	1.12	@
Girls	20	14.45	3.788			0.446

Note: @ Not Significant at 0.01 levels.

Table 4: Difference among Low, Middle, High Income Groups of Experimental Group in Retention Test

Income	N	Mean	SD
Low	13	14.7	4.32
Middle	21	13.95	3.39
High	7	14	2.45

Table 5: "F" value of Family Income Categories Experimental Group in Retention Test

Measures	SS	DF	MSS	F	p
Between	4.842	2	2.421	@ 0.188	0.829
Within	489.40	38	12.879		
Total	494.241	40			

Note:@ Not significant at 0.01 level

Table- 4: Difference among categories of Parents Educational Qualification in Experimental Group of Retention Test

Categories of PEQ	N	Mean	SD
Illiterate	8	14	3.4
School level	21	14	3.2
Above school level	12	14.67	4.3

Table 5: “F” value of categories of PEQ of Retention Test in Experimental Group

Measures	SS	DF	MSS	F	p
Between	3.810	2	1.905	@ 0.148	0.863
Within	489.10	38	12.871		
Total	492.92	40			

Note: @ Not significant at 0.01 level

Table 6: Difference among Small, Medium and Large Family size categories of Experimental Group in Retention Test

Family Size	N	Mean	SD
Small	24	14.21	3.33
Medium	10	14.2	4.62
Large	7	14.14	2.7

Table 7: “F” value of categories of FS of Retention Test in Experimental Group

Measures	SS	DF	MSS	F	P
Between	0.025	2	0.012	@ 0.001	0.999
Within	491.051	38	12.922		
Total	491.075	40			

Note: @ Not Significant at 0.01 level.

Table 8: Difference Between Boys and Girls of Control Groups in Retention Test.

Groups	N	Mean	SD	Mean Difference	SE	Calculated “t” Value
Boys	21	12.33	3.603	0.02	1.02	@ 0.0196
Girls	20	12.35	2.868			

Note: @ Not Significant at 0.01 level

From the table it is found that there is no significant difference between the means of boys and girls in control group with reference to their retention test scores. The mean differences are not significant at 0.01 levels.

Table-9 : Difference among Low, Middle and High Income categories of Control Group in Retention Test

Income	N	Mean	S.D
Low	13	12.53	3.296
Middle	21	12.09	2.893
High	7	12.71	4.096

Table-10: “F” value of Family Income categories control group in Retention Test

Measures	SS	DF	MSS	F	p
Between	2.739	2	1.370	@ 0.131	0.878
Within	398.416	38	10.485		
Total	401.155	40			

Note: @Not significant at 0.01 levels

Table 11: Difference among Illiterate, School level and Above School level, Parents Educational Qualification Groups of Control Group in Retention Test

Categories PEQ	N	Mean	SD
Illiterate	8	12.38	3.603
School Level	21	12.33	3.314
Above School Level	12	12.33	2.925

Table 12: “F” value of categories of PEQ of Retention Test in Control Group

Measures	SS	DF	MSS	F	P
Between	0.013	2	0.007	@ 0.001	0.999
Within	404.635	38	10.648		
Total	404.648	40			

Note: @ Not Signification at 0.01 level

Table 13: Difference among Small, Medium and Large of Family size categories of Control group in Retention Test

Category of FS	N	Mean	SD
Small	24	12.54	3.0
Medium	10	12.2	3.71
Large	7	11.85	3.4

Table 14: “F” value of categories of FS of Retention test in Control Group

Measures	SS	DF	MSS	F	P
Between	2.837	2	1.418	@ 0.135	0.874
Within	400.237	38	10.533		
Total	403.074	40			

Note: @ Not significant at 0.01 levels

IX. FINDINGS OF THE STUDY

The following are the some of the major findings attained from the present study:

- Children those who learned science concepts using mind maps scored more than conventional method of teaching group. This method facilitated the children in learning science concepts rather than their counterparts in conventional method of teaching.
- Children those who learned science concepts through mind maps have more Retention ability than conventional method of teaching group. This method facilitated the children to achieve better retention in learning science concepts rather than their counterparts in conventional method of teaching.
- The methodology using mind maps has equal impact on the achievement of boys and girls. The conventional teaching strategy has equal impact on the achievement of boys and girls.
- The significant difference in the pre test and post test scores and pre test and retention test scores of children exist in the experimental group. The significant difference in the pre

test and post test scores and post test and retention test scores of children exist in the control group.

- Children of experimental group are alike in Retention scores. This mind map tactics is equally facilitating for delayed Retention on the achievement of children, irrespective of the Family Income (Low, Middle and High).
- Children of control group are alike in retention scores. Conventional teaching strategy is equally facilitating for delayed retention on the achievement of children with irrespective of the Family Income (Low, Middle and High)
- Children of experimental group are alike in Retention scores. Teaching methodology using mind maps is equally facilitating for delayed retention on the achievement of children irrespective of their Parents Educational Qualification (Illiterate, School Level and Above School Level)
- The significant difference in the retention test scores of children in the control group exists with regards to their Parents Educational Qualification (Illiterate, School Level and Above School Level).
- Children of experimental group are alike in Retention scores. Mind maps using methodology is equally facilitating for delayed Retention on the achievement of children irrespective of the Family Size (Small, Medium and Large)
- The children of control group are alike in retention scores. Conventional teaching strategy is equally facilitating for delayed Retention on the achievement of children irrespective of the Family Size (Small, Medium and Large).
- There is positive relationship between immediate Retention and delayed Retention of children in learning science concepts through cooperative learning method.
- There is positive relationship between immediate Retention and delayed Retention of children in learning science concepts through conventional method of teaching.

IX. LIMITATIONS OF THE STUDY

The present investigation has been made with particular reference to secondary school students in Virudhunagar District. This study is limited to only Tamil Medium students in Government High/Higher secondary school in Virudhunagar District. This study is limited to only science teaching of students in secondary schools. Since experimental design has been used, the size of the sample selection is limited.

XI. SUGGESTIONS FOR FURTHER RESEARCH

- i.) The present investigation was attempted with limited number of children. The validity of these findings could further be substantiated with larger sample.
- ii.) Only the secondary level was taken for this study this can be extended to other levels like higher secondary and college levels.
- iii.) Experimental studies should be carried out to further examine the effect of other instructional strategies on children achievement.
- iv.) This kind of investigation can be made on other subjects also.

XII. CONCLUSION

In the present study, the children studying in high/higher secondary school in virudhunagar district were investigated. Knowledge about leaning method is quite essential to inculcate proper thinking and corrective methods on the part of the students in learning science concepts. Hence, the curriculum for the teaching methods must be provided in all educational institutions. The educational methodology using mind-maps is a successful teaching technique. It provides greater educational opportunities for the children. It helps in bringing new kinds of experience for the children in schools to make education more interesting and meaningful. This research study reveals that the children learn better through small group activities than the conventional method. The cooperative learning method helps the children to achieve better and to perform well in their studies. Hence, the teachers, Heads of the institutions and the policy makers should make effort to maximize the usage of cooperative activities in the classroom climate.

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A Review On Electrochemical Machining Processes Parameters Optimization

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1 st	Sivakumar A.	Assistant Professor Department of Mechanical Engineering, Varuvan Vadivelan Institute of Technology, Dharmapuri, Tamil Nadu - India
2 nd	Arularasu M.	Professor Department of Mechanical Engineering, Varuvan Vadivelan Institute of Technology, Dharmapuri, Tamil Nadu - India
3 rd	Ashok Kumar N.	Assistant Professor Department of Mechanical Engineering, Varuvan Vadivelan Institute of Technology, Dharmapuri, Tamil Nadu - India

Abstract

An electrochemical machining process is a major electro-machining process with special capabilities. Electrochemical Machining (ECM) give a better alternative in generating accurate three dimensional complex shaped components and components which are difficult-to-machine materials by conventional methods of machining. This review paper deals with the fundamental research on Electrochemical Machining (ECM) processes parameters optimization for higher metal removal rate (MRR) and better surface roughness (Ra). From the past observation electrochemical machining is a very effective method based on machining cost compared with conventional machining of hard materials. There are many researchers experimentally investigated to find the optimum level of machining parameters which affect the surface roughness and material removal rate are briefly reviewed in this paper.

I. INTRODUCTION

Electrochemical Machining (ECM) is an unconventional machining process is used to machine the material, which cannot be machined in conventional processes. Electrochemical Machining reverse processes of electrochemical coating. In ECM the work piece acts as the anode and tool act as cathode, both immersed into electrolyte and placed closely with a gap of about 0.5 mm. If potential difference is applied between the work piece and the tool, the positive ions move towards the tool and negative ions move towards the work piece. Fig. 1 shows the schematic diagram of electrochemical machining

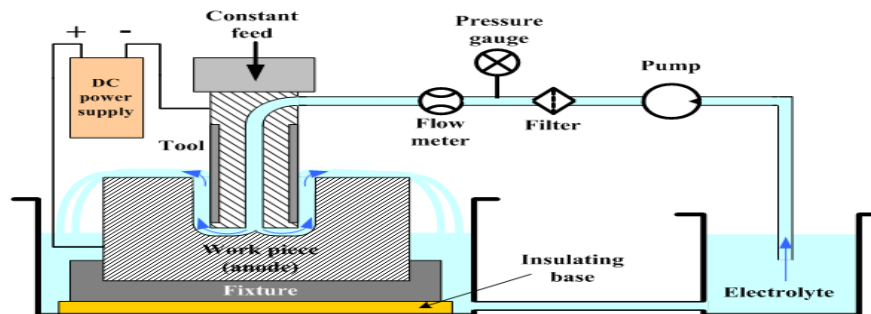


Figure 1: Schematic diagram of ECM

Tool feed rate, electrolyte flow rate, material removal rate, surface roughness and applied voltage are the important processes parameters in electrochemical machining .these parameters influences dimensional accuracy, tool life, material removal rate (MRR) and surface roughness (Ra) Many researchers trying to find optimum electro chemical machining parameters with various electrolyte material, varying the applied voltage and electrode gap. There are so many investigations are conducted to enhance the process parameters, in which some of the experimental works done by the researchers are reviewed.

II. REVIEW ON ELECTROCHEMICAL MACHINING PROCESSES

- Pradeep Kumar P et al. [1] investigated the improvement in the material removal rate of electrochemical machining experimentally. The Material Removal Rate (MRR) calculated for different electrolytes condition on aluminum and stainless steel. The experimental results indicate that the actual and theoretical material removal rates by using sea water as an electrolyte in electrochemical machining on aluminum alloy and steel alloy gives better MRR.
- Deepanshu Shrivastava et al. [2] investigated the metal removal rate(MMR), overcut and surface roughness(Ra) of mild steel work piece of diameter 50 mm as by using copper electrode and brine solution as electrolyte by using Taguchi L9 orthogonal array approach. Then optimized the best setting of process variables for higher MRR, lower surface roughness and overcut. Three parameters chosen as process variables are: voltage, tool Feed rate and Electrolyte concentration. In this investigation of ECM process on Mild steel of diameter of 50 mm. The considered L₉OA based on Taguchi design. Three factors were considered that are voltage, tool feed rate and electrolyte concentration. These experiments were conducted to obtain high MRR, low overcut

and low surface roughness. Among three factors feed rate is mostly effected the metal removal rate (MRR), then comes voltage and at last electrolyte concentration. For surface roughness, feed rate effects it most then concentration and at last voltage. Tool feed rate effects most to overcut at second rank is voltage and at third rank is concentration which affects most to overcut.

- L. Tang et al. [3] described electro chemical machining of Special stainless steel 00Cr12Ni9Mo4Cu2, which has multiple composition and inhomogeneous tissues; short circuiting frequently occurred during machining when using conventional electrolyte processing. They analyzed the reason of machining is difficult from the material composition and structure. They used the NaNO₃ and NaClO₃ electrolyte composite to select the appropriate concentration, and then by using the orthogonal experiment and gray relational analysis method. Under optimal conditions of 20 V, an electrolyte composite concentration of 41 g/l NaClO₃ and 178 g/l NaNO₃, a feed rate of 0.7 mm³/min, and an electrolyte pressure of 0.8 MPa, a material removal rate of 100.8 mm³/min, a surface roughness of Ra 0.8, and a side gap of 0.16mm were produced. For the same voltage, with an increasing cathode feed rate, the MRR was shown to decrease in side gap while increase while the surface roughness value. Under the same cathode feed rate, the MRR decreased, while the side gap and the surface roughness increase as the electrochemical machining application voltage increases. Their studies proves that using a certain concentration of electrolyte composite is a simple, low-cost, and feasible approach in improving efficiency and quality.
- Chinnamuthu Senthilkumar et al. [4] investigated the Electro Chemical Machining for machining of LM25 al/10% SiCp composites during electrolysis with sodium chloride as electrolyte and copper as tool. The process parameters such as applied voltage, MRR, electrolyte concentration, tool feed rate and electrolyte flow rate were determined by performing experiments on METATECH ECM equipments. The mathematical models were developed based on response surface methodology and were tested by ANOVA and the parameters were optimized by NGSA – II approach. The results showed optimized MRR and Ra. Optimization will increase production rate considerably by reducing machining time.
- S. S. Uttarwar et al. [5] described the Electro Chemical Machining of stainless steel EN series 58 A (AISI 302 B). They researched the effect of voltage variation on metal removal rate. Inter electrode gap (IEG) was maintained constant during the experimentation. They found that the MRR improved significantly by increasing the voltage.
- Charan Shivesh et al. [6] investigated the material removal rate by controlled anodic dissolution at atomic level of the work-piece with a hollow cylindrical copper electrode electrically conductive, stainless steel electrode and aluminium electrode, Mild Steel as work piece. The investigation carried out to find the influence of machining parameters such as Electrolyte concentrations, current density and

electrodes. From the experiment, they concluded that by the use of different electrolyte concentrations there is a change in material removal rate. It increases as electrolyte concentration increases. Also by using various types of tools like stainless steel, aluminium and copper it affects the material removal rate. Out of which copper tool material showed good results as compared to the aluminium and stainless steel. By increase in current density, the material removal rate is also increases. At 10 amp MRR is greater than at 5 amp for given tool material and electrolyte concentration.

- K. Chopde et al. [7] described the Electro Chemical Machining of SS AISI 30 4 work piece Taguchi approach of experimentation showed the best performance in terms of MRR, and surface roughness can be obtained by variation in current, feed rate and electrolyte concentration. It was observed that MRR increased with increase in current and current. Furthermore, high MRR is achieved by increasing the speed of chemical reaction.

III. DISCUSSIONS AND CONCLUSIONS

Using modern unconventional machining process like electrochemical machining operation, we can obtain improved high surface quality, higher in material removal rate and low tool wear have been reviewed. Further research in this area might help enhanced material removal rate. In this review it was clear that recent research on electrochemical machining has focused on computer based process simulation, online process-monitoring, the design and optimization of the machines, as well as on the development of hybrid machining techniques. The most machining performances considered by the researchers are Surface roughness (Ra), Metal removal rate followed by machining/production costs. The application of new techniques in optimizing electro chemical machining process parameters gives good results as proven from the literature.

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Affecting Factors on Students' Academic Achievement at the Secondary Level in Rural Schools

Paper ID LJIFR/V4/ E5/ 029 **Page No.** 6254-6258 **Subject Area** Education

Key Words Students' Academic Performance , Achievement Scores , Socioeconomic Status, Academic Achievement, Gender Differences

1 st	Dr. K. R. Rajenran	Graduate Assistant, GHS School, Malaipatti, Tamil Nadu
2 nd	A. Selvaraj	Ph.D scholar, Dravidian University, Kuppam (A. P.)
3 rd	Dr. S. Rajaguru	Associate Professor Department of Education, SRKV college of Education, Coimbatore
4 th	B. Chandrasekaran	Graduate Assistant, GHS School, Aavalur, Tamilnadu

Abstract

This study focused on various affecting factors on the students' achievement at the secondary level in the rural, remote schools especially in the subject's mathematics and science. The sample selected for the study comprised a total of 100 students who were studying 9th standard in two rural, remote schools in Virudhunagar district. This study aims at the factors which are the route causes for the students' academic achievement focussing on their heredity, family socio-economic status, co-operation from their counterparts, parent's educational status and gender differences. The results of the study revealed that socio-economic status (SES) and parents' education have a significant effect on students' over all academic achievement as well as achievement in the subjects of Mathematics and Science. The high and average socio-economic level affects the performance more than the lower level. It is very interesting that parents' education means more than their occupation in relation to their children's academic achievements at school. It was found that female students perform better than the male students.

I. INTRODUCTION

Education is a growing academic discipline. Nowadays it is proclaimed correctly that every birth cries for education. In this era of globalization and technological revolution, education is considered as a first step for every human activity. It plays a vital role in the development of human capital and is linked with an individual's well being and opportunities for better

living (Battle & Lewis, 2002). It ensures the acquisition of knowledge and skills that enable individuals to increase their productivity and improve their quality of life. This increase in productivity also leads towards new sources of earning which enhances the economic growth of a country (Saxton, 2000). The students' academic achievement is given the top-most priority by the educators. It is meant for making a difference locally, regionally, nationally and globally. Educators, trainers, and researchers have long been interested in exploring variables contributing effectively for quality of performance of the learners. These variables are inside and outside school which play the vital role in students' academic achievement. These factors may be termed as *student factors*, *family factors*, *school factors* and *peer factors* (Crosnoe, Johnson & Elder, 2004). Generally these factors include age, gender, home environment, social atmosphere, socioeconomic status (SES), parents' educational status, parental profession, language, income etc; in a broader context demography is referred to as a way to explore the nature and effects of demographic variables in the biological and social context. Unfortunately, defining and measuring the quality of education is not a simple issue and the complexity of this process increases due to the changing values of quality attributes associated with the different stakeholders' view point (Blevins, 2009; Parri, 2006). Besides other factors, socioeconomic status is one of the most affected factors among educational professionals that contribute towards the academic performance of students. The most prevalent argument is that the socioeconomic status of learners affects the quality of their academic performance. Most of the experts argue that the low socioeconomic status has negative effect on the academic performance of students because the basic needs of students remain unfulfilled and hence they do not perform better academically (Adams, 1996). The low socioeconomic status causes environmental deficiencies which results in low self esteem of students (US Department of Education, 2003). More specifically, this study aims to identify and analyze factors that affect the quality of students' academic performance.

II. OBJECTIVES OF THE STUDY

- i.) Analyzing the effect of socio-economic status, parental education and occupation on students' academic performance.
- ii.) Exploring the effect of socio-economic status on student's achievements in the subjects of Mathematics and Science..
- iii.) To find the difference among the students' achievement in relation to their gender differences.

III. HYPOTHESES

- i.) There is no significant difference of socio-economic status, parental education and occupation on students' academic performance.
- ii.) There is no significant difference of socio-economic status on student's achievements in the subjects of Mathematics and Science.
- iii.) There is no significant difference among the students' achievement in relation to their gender.

IV. RESEARCH METHODOLOGY

This study was conducted using descriptive survey method. The population was the secondary school male and female students from two rural, remote schools in Virudhunagar district. Only fifty volunteer students (25 male and 25 female) out of all volunteers from one section of the 9th std were selected randomly from each of the 2 schools. Thus the sample size for the study was 100 students (50 male and 50 female). The study was delimited to only demographic factors such as students' gender, parents' education, parents' occupation and socio economic status. The quality of academic performance was measured by their achievement scores of the 8th std annual examination verified from the school records. Data regarding the variables such as parents' education, parents' occupation, Socio-economic status and students' gender were collected by using a questionnaire.

V. STATISTICAL ANALYSIS AND INTERPRETATION

The collected data were analyzed by applying descriptive and inferential statistical measure. A t-test was used to compare the achievements of male and female students. The significant effect of different factors on students' achievement was explored through multiple comparisons by applying ANOVA using SPSS 16.

Table 1: Effect of SES, Fathers' and Mothers' education & occupation on students' achievement Source of Variation

	Sum of Squares	df	Mean Square	F	Sig.
SES & Marks in 8 th std	110977.4	2	55488.70	15.270	.000*
SES & Marks in Mathematics	7254.485	2	3627.243	9.086	.000*
SES & Marks in science	9154.629	2	4577.314	14.896	.000*
Father's education & Marks in 8 th std	191918.8	7	27416.97	7.576	.000*
Mother's education & Marks in 8 th std	191049.05	7	27292.72	7.831	.000*
Father's occupation & Marks in 8 th std	23541.57	3	7847.190	2.072	.103
Mother's occupation & Marks in 8 th std	9088.016	3	3029.339	0.795	.497

This Table shows that socio-economic status (SES), fathers' education, and mothers' education, had a significant effect on students' overall academic achievement as well as on Mathematics and science scores in 8th standard at the .05 level of significance. Further it is

obvious that parental occupation had no significant effect on academic achievement. Hence the hypotheses that there are no significant effects of SES level and parental education level on students' academic achievement have been rejected. Also the hypothesis that there is no significant effect in achievement on the basis of parental occupation was accepted. It is therefore concluded that SES level and parental education affect the achievement of their children, but the parents' occupation had no effect on SES levels (Low, Average & High) on students' achievement scores in the subjects of Mathematics, science & Cumulative achievement indicated that students belonging to high SES level overall perform better in the subjects of Mathematics and English as well as show better performance in cumulative achievement scores. Average and high SES levels have more effect than low SES level in all types of achievement quality. The null hypothesis that there is no significant difference in academic performance of students due to their socio-economic status is therefore rejected. The students with high and average SES exhibit better quality of performance than the students with low level of SES. The multiple comparisons show that fathers with Bachelor degree and Master degree education have more affects on students' achievement than any other level of education (e.g., illiterate, secondary, intermediary).

It is evident also that mothers with Secondary, Intermediary, and Bachelor degree-education levels have significant effects on the achievement of their children as compared to other education levels.

It is also found that there is a significant difference in the marks of male and female students. The null hypothesis that there is no significant difference in the quality of academic performance of students in relation to their gender is therefore rejected. It is concluded from the results that female students perform better than the male in the subjects of Mathematics and Science as well as in the overall achievement scores.

VI. RECOMMENDATIONS

- i.) There are various factors in and out of the school premises those affect the quality of academic performance of students. This study only focused on some of the factors outside school that influence the student's achievement scores. The main aspect for the educators is to educate their students effectively so that they may be able to show quality performance in their academics. To achieve this objective it is of vital importance for the educators to understand better about the factors that may contribute in the academic success of students.
- ii.) Further research is needed to explore the problem on a large sample from more scattered rural/ urban schools including other student factors, family factors, school factors and peer factors.

VII. CONCLUSION

This study concluded that the higher level of Socio-economic Status is the best indicator contributing towards the quality of students' achievement. Family characteristics like socio economic status (SES) are significant predictors for students' performance at school besides the other school factors, family, environment, gender differences and counter parts. Higher

SES levels lead to higher performance of students in studies, and vice versa (Hanes, 2008). Parental education also has effects on students' academic performance. Parental occupation has little effect on their child's performance in studies than their education. Student's gender strongly affects their academic performance, with girls performing better in the subjects of Mathematics, and Science as well as cumulatively. Girls usually show more efforts leading towards better grades at school (Ceballo, McLoyd & Toyokawa, 2004). It is very important to have comprehensible understanding of the factors that benefit and hinder the academic progress of an individual's education. To determine all the influencing factors in a single attempt is a complex and difficult task. It requires a lot of resources and time for an educator to identify all these factors first and then plan the classroom activities and strategies of teaching and learning. It also requires proper training, organizational planning and skills to conduct such studies for determining the contributing factors inside and outside school. This process of identification of variables must be given full attention and priority so that the teachers may be able to develop instructional strategies for making sure that all the children be provided with the opportunities to arrive at their fullest potential in learning and performance

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